

ROADS AND STREETS

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REAL CAUSE

of

Railway Financial Distress

*Highway Transport
Not a Factor*

By H. P. GILLETTE

Editor, Roads and Streets

WHEN the writer was chief engineer of the Washington Railroad Commission, in 1906 and 1907, and for several years thereafter, he believed that the regulation of railways by state and federal commissions was destined to benefit not only the public but the owners of railway securities. Gradually it began to dawn upon him that the regulation of railway rates was becoming injurious both to the public and to the owners of railway securities. However, the ill effects might be attributed to inexperience on the part of state and federal commissioners; so he continued to hope for better results. That hope was abandoned many years ago.

There are two exceedingly grave defects in the system of public regulation of rates. The first defect is one the late William Howard Taft pointed out when he was president, namely, that our regulatory commissions are both judges and prosecuting attorneys. He might well have added that they are often judges whose continuance in office depends largely upon their pleasing the voters by holding railway rates down to the lowest

point that is attainable short of throwing the railways into bankruptcy. The buyer of any public service is prone to think that he is paying too much for it. When he is told repeatedly in his newspaper that he is paying too much, he is almost certain to protest every raise in railway rates. If he belongs to an association of business men or farmers, he may voice his protest, accompanying it with a scarcely veiled threat that he will try to get the scalp of any railway commissioner who recommends a raise in railway rates. So the result has been that in most instances, railways seeking a reasonable rate increase were given either none or an inadequate one.

During the decade ending in 1929 railway net earnings averaged less than 5 per cent annually on the investment in railway plant, not because railway executives were satisfied with the rates but because appeals for adequate rates had been met with refusal. In 1927 the writer made a thorough study of the yields to investors in railway securities, and found that if purchased at the then market value, the total annual net earnings divided by the total market value of railway securities exceeded 7 per cent. This was the average market rate for money that was actually going into railway securities of all classes. Yet a railway was prevented by law

from earning more than 6 per cent on the value of its property, without having half of any excess above 6 per cent taken away by the government and placed in a fund for the benefit of the less successful railways. This was bad enough, but the Interstate Commerce Commission was letting very few railways reach that 6 per cent dead line even in good times. What would happen in bad times they failed to consider at all. So now we see our railways, taken as a whole, failing to earn bond interest and facing bankruptcy unless they continue to receive federal loans. This outrageous condition is the direct result of railway rates that have not been adequate in a single year since the world war ended. By adequate, we mean sufficient to enable the railways as a whole to earn about 7 per cent annually on the appraised value of their property. Even had they earned but 7 per cent as an average on the actual cost of their property, the present disastrous situation would have been prevented. The I. C. C. has been declaring its belief in actual cost rather than appraised value, as a rate base, yet it has failed to act upon that belief and grant even the inadequate 6 per cent net earnings.

Railway executives have made a mistake of the first order in failing to appeal continuously to the public long ago for fair treatment. Now that they are making such an appeal many of them are becoming unfair, for they are attributing much of their misfortune to motor-truck competition, in the face of the fact that the railways carried more freight ton-miles in 1929 than ever before.

The second grand defect in our rate regulatory system is one founded upon the belief that net earnings or profits should be limited to a prescribed percentage either on the cost of the property or on its appraised value. Any such limitation is economically vicious, for it takes away most of the incentive to make improvements that will lower the cost and increase the profits above the prescribed 6 or 7 per cent. Imagine a rate regulatory commission ordering Marconi to reduce the rates on wireless messages across the ocean to a level that would yield, say, 7 per cent on the investment in his plant. His reply would be that had he known that his inventive genius was to receive no greater reward than that, he would never have invented inexpensive devices to do what expensive ocean cables do.

"Ah, but you should remember, Mr. Marconi, that when your plant is a public utility you must forego making much more than a mortgage rate of interest on the invested capital."

In essence this is what the Interstate Commerce Commission has been saying to inventors and capitalists in the railway field for 25 years. The result has been exactly what might have been foreseen. Both venture-some brains and venturesome capital have usually gone into other fields in preference to the railway field. There have been many mechanical improvements in the railway field, but nothing revolutionary during the last generation. Electrification of railway lines has been accomplished here and there but not to an extent that

Regarding railroad and highway transport, each type of service has its field of economic usefulness.

I'm Telling You!

The GAS TAX is the GREATEST JOB MAKER THERE IS!
9¢ out of every DIME goes for LABOR —

WORK for THOUSANDS

2 GALLONS of GAS on GOOD ROADS

GIVE YOU AS MANY MILES AS 3 GALLONS on POOR ROADS

Are they trying to GRAB ALL the GAS TAX in OUR State?

Everytime they take GAS TAX MONEY AWAY from ROADS — MORE PEOPLE LOSE THEIR JOBS!

I'm Telling You!

28 MILES OUT OF EVERY 30 MILES OF ROAD IN THE U.S. ARE STILL UNPAVED!

Your Car Wears out nearly 37% faster on POOR Roads than on GOOD Roads!

OF the 1931 Expenditure on Roads, Labor received \$1,363,806,239.00
This is enough to give work to 2,331,382 men for 6 months —

GAS TAX = GOOD ROADS = Less Wear on Your Car More Work for More Men

has appreciably changed the picture. Motorization has been experimented with in a half hearted way. But why should any railroad president scrap locomotives at any such rate as manufacturers scrap their machinery as a result of improvements? The average life of a locomotive exceeds 20 years. The average life of machinery in many other fields is less than 10 years, not because the machines are worn out but because invention has made them obsolete.

In 1930 there were 1,600 American industrial research laboratories that employ 31,000 men. Of all the railway companies in America only two reported having research laboratories. One of those two numbered only 33 men and the number in the other is not stated. It will not do to say that railways do not need research laboratories because their engineering staffs are researchers, for nearly all the industrial companies that maintain research staffs have also engineering staffs. The research laboratory is a modern device for speeding up economic improvement. The Bell Telephone Laboratories employ 3,000 men, yet the Bell System employs several times that number of engineers on their staffs.

Railway executives are not to blame for not having research laboratories. What is the object of rendering their present plant obsolete, when their earnings have been too small to enable them to build up adequate depreciation reserves?

There is a cost of progress, which is mainly that that results from obsolescence. There must be a profit re-

sulting from progress sufficient not only to pay the cost of progress but to attract both inventive brains and venturesome capital. The automotive industry exemplifies an industry that has attracted these items. The railway industry may well be contrasted with the automotive.

Contrary to the opinion of the Interstate Commerce Commission, the way to secure the maximum reduction in freight rates is not by holding them down to a starvation level, but by raising them to a point where inventive brains and venturesome capital will do for the railway industry what they have done for the automotive industry and for the electric power industry. Power and lighting rates average lower now than in 1913, simply because state utility commissions have usually been liberal as to the profits that power companies were permitted to earn. Costs of generating and distributing power per kilowatt-hour have shown a remarkable downward trend for more than 40 years. Rates of charge for electric current have followed the cost trend. Between 1900 and 1913 there was a decline of only 5 per cent in average freight rates per ton-mile, and since 1913 the increase has been 50 per cent, which shows clearly that there was no appreciable economic progress in the "art of rail haulage."

The inescapable fact is that, American rail transportation has not made appreciable economic progress during more than a generation. The writer believes that the primary cause is to be found in the rate regulatory policy enforced by the Interstate Commerce Commission.

County and local roads are acknowledged to be important feeders to railroads in their trade territories.

I'm Telling You!

For each motor vehicle in the United States there is **ONLY 148.7 Feet of Surfaced Road**



It costs 7.5 cents a mile to operate the average car over low grade roads, but only 5.44 cents a mile on paved roads

| | |
|-----------------------------------|------|
| LOW GRADE ROADS—TOTAL COST → 7.5¢ | |
| PAVED ROADS TOTAL COST → 5.44¢ | 1.61 |
| GASOLINE | 1.09 |
| TIRES AND TUBES | 0.39 |
| MAINTENANCE | 0.84 |
| OIL | 0.22 |
| DEPRECIATION | 0.14 |
| LICENSE | 0.14 |
| GARAGE & REPAIR MO. | 0.14 |
| INTEREST @ 6% | 0.14 |
| INSURANCE | 0.14 |
| | 2.11 |
| | 1.57 |

The Gas Tax means bread and butter for millions of men, women and children if USED for ROADS—

Don't
Let Them Grab The Gas Tax in Our State!



I'm Telling You!

IF THE GAS TAX WERE USED FOR ROADS ONLY, 2,000,000 CHILDREN WOULD GET ENOUGH TO EAT—



Riding on POOR Roads makes you buy 3 TIMES More Tires than riding on GOOD Roads!



Our word "ROAD" comes from the Anglo-Saxon "RAD"—meaning "RIDE"

Truck Regulation and Competition With the Railways

By PYKE JOHNSON

Vice-President, National Automobile Chamber of Commerce, Washington, D. C.

RAILROAD spokesmen cite "unregulated competition" on the highways as one of the major railroad ills. What is this "unregulated competition?" Where does it pinch? How extensive is it? What should be done about it?

Ownership of Trucks.—Government surveys show that about 86 per cent of all trucks are privately owned, and operated in the business of the owner.

But 14 per cent are either contract carriers or common carriers.

The largest fleets, as well as the greatest number of vehicles fall in the first classification.

Farm ownership accounted for 26 per cent of these vehicles.

The large oil companies, milk and dairy products handlers, bakers, ice companies, groceries, laundries, beverage distributors, and department stores maintain large fleets of trucks engaged in the retail distribution of goods or in the handling of commodities in the course of business.

The American Telephone and Telegraph Company maintains a fleet of 15,000 trucks; the Standard Oil Company of New Jersey 12,000; Borden Company 10,000, and so on down the list.

This is the greatest "unregulated" truck movement, but how far it is competitive is another story.

Few For-Hire Trucks Unregulated.—In the field of operation of vehicles for-hire, it is a matter of fact that there is no Federal regulation of for-hire truckers in interstate commerce.

The Bureau of Public Roads puts the percentage of these vehicles at slightly in excess of 1 per cent of the 3,250,000 trucks now on the road. The Interstate Commerce Commission estimates that they handled about 0.8 per cent of the total inland traffic mileage in 1929.

In the intrastate field, 39 states and the District of Columbia have laws regulating the common carrier trucker, while 34 states have enacted laws regulating the contract carrier. In the latter group but 23 states have such laws in effect, due to the fact that courts have declared invalid acts in 4 states, while those in 7 others seem also to be invalid.

Negligible Percentage of Tonnage Handled by "Unregulated" Carriers.—Summarizing then, the truckers that are unregulated (as to business operations) we find: carriers for hire in interstate service; common carriers in 9 states; and contract carriers in 25 states are unregulated. The tonnage they handle is only a part of the less than 6 per cent of all rail and truck freight ton miles representing truck hauling intercity, (1929 estimate).

Surely then, one might be justified in querying the validity of the argument that "unregulated highway competition" is a major issue in the transportation problem.

Railroad Authority Cites Small Truck Competition.—Daniel Willard, President of the Baltimore & Ohio Railroad, cites a loss in railroad tonnage for 1932 amounting to 50 per cent of the preceding 10-year average, but puts the loss to trucks at only 10 per cent.

The Alexander Hamilton Institute Business Conditions Weekly said last October:

"If all motor truck transportation were entirely eliminated and the railroads were able to add all the motor truck freight to the present volume of railway freight, the railroads would not benefit materially."

The Railroad Security Owners Association in studying the effect of rail highway competition in Eastern United States said further in its report last year:

"In spite of the inroads upon carload traffic made by motor trucks, the chief competition offered to the railroad by this form of transportation is in the less-than-carload field."

Truck Movement Is Important.—The relatively small ratio of total ton mileage attributed to movement by motor trucks does not belittle the importance of the truck.

Rather, it emphasizes the short haul feature of that vehicle's service.

The average capacity of all trucks is about 1.7 tons.

The average capacity of a railroad freight car is 47 tons. The average haul of a ton of freight on all railroads as a system is about 316 miles.

Therein lies the answer to the relatively small impression of the truck on the ton mileage total.

Truck Important in Certain Fields.—The peculiar advantages of the motor truck are more evident in some fields than in others. Thus, one third of all livestock moved to terminal markets last year went by truck.

Up to 99 per cent of the milk supply of large cities reaches them over the highways.

A large share of the fruit and vegetable receipts in important markets are delivered by truck.

Furniture has always been adapted to truck handling.

Retail delivery of dry goods, groceries, milk, and other final consumption goods is almost entirely by truck.

High Rail Rates on Coal Forcing Tonnage to Trucks.—Rail freight charges now represent 64 per cent of the delivered cost of coal.* Apparently that fact has resulted in an increasing tonnage of coal moving by truck.

The National Coal Association recently compiled a series of reports received from all parts of the country, showing the extent to which this transfer of tonnage is taking place:

"In the case of communities within a radius of 30 miles of bituminous coal mine operations this practice has been and still is increasing very rapidly. In some instances mine operators are reported as spending substantial amounts of money to equip their mines for the loading of trucks. Judging from what has happened in certain of these communities the retailing of coal delivered by rail will soon be, if it has not already been, largely eliminated.

"The distance over which coal is being transported by truck is rapidly increasing. While the great majority of such movements are still confined within a radius of approximately 50 miles, instances are recorded of longer hauls, reaching a maximum in some places of between 200 and 300 miles. . . ."

Relative Importance of Commodity Groups to Railroad Tonnage.—In any discussion of transportation it is important to know what commodities are important fac-

*National Coal Association.

tors in rail tonnage. For the year 1931 the Interstate Commerce Commission shows the following:

| | Per Cent |
|-------------------------------------|----------|
| Products of agriculture..... | 10.9 |
| Animals and products..... | 2.4 |
| Products of mines..... | 56.1 |
| Products of forests..... | 4.8 |
| Manufactures and miscellaneous..... | 23.2 |
| All l.c.l. freight..... | 2.6 |

Revenues from these groups will not vary materially from the ratio of the tonnage figures.

This simply means that when anyone says that trucks are now hauling one third of all livestock, the fact assumes its proper significance when it is noted that animals and products were but 2.4 per cent of rail tonnage in 1931.

The l.c.l. tonnage, sometimes referred to as the "Cream of the traffic" and amounting to 2.5 per cent of the total tonnage, requires 25 per cent of the equipment, averages 2.6 tons per freight car, and returns 10 per cent of the revenue. Here the truck competition has been felt more severely.

Decreases in Commodities Analyzed by Interstate Commerce Commission.—An analysis by the Interstate Commerce Commission of rail freight commodity classification tonnage from 1928 to 1931 shows the difference in the percentage of decline in marketing and production and the decline in rail tonnage.

In products of agriculture the difference was but 1 per cent; 16 per cent on animals and products; 7 per cent in products of mines, nothing in products of forests, and 5 per cent in manufacturing and miscellaneous.

Included in this difference between production and rail tonnage are all the other factors of substitution of materials, relocation of industries, electrification of industry and new practices in transportation, such as the development of car consolidation, freight forwarding agencies and other practices.

Rail Transport Also Needs Examining.—Railroad pronouncements indicate some of the ways in which the motor truck and bus can be used to further economies in rail operation.

L. F. Loree, President of the Delaware & Hudson R.R., is authority for the statement that 30 per cent of all the railroad mileage carries less than 2 per cent of the ton mileage.

Conversely, half the rail ton mileage is moved over 10 per cent of the rail mileage.

Abandonment of a larger short haul mileage of track and substitution of motor transport would materially aid rail revenues.

It is an interesting fact that many of the major developments in rail transportation have originated outside rail management. The Pullman service, express, parcel post, refrigerator cars, consolidated cars and freight forwarding have been developed by outside agencies using the railroad's own facilities.

Even now the Railway Express Agency—a stepchild of the railroads—is conducting experiments in the pick-up and delivery fields. Why shouldn't the rails handle these services—sell transportation rather than railroad tickets or bills of lading?

More or Less Regulation?—If the answer to our motor transport problem is to be more regulation for rail competitors, then the 86 per cent of motor trucks privately owned must come under the regulatory lash, if any important tonnage is to be returned to the rails.

Three routes to more regulation lie open. It behooves the road user to maintain guard over every one of them.

1. Unduly stringent and unnecessary physical limitations may be imposed on the vehicles.

In Texas a law was passed—and declared constitutional—which limited trucks to 7,000 lbs. *if passing a railroad station with load*, and to 14,000 lbs. *if going to a railroad station*. Surely the highway was no less affected with the load destined for rail transport than with the load traveling the whole distance by highway.

2. The imposition of "business regulation" to hamstring carriers for hire.

Texas—again—required all contract carriers to secure permits before operating, and then closed down on the issuance of permits. Result, the contract carriers leased their vehicles to the shippers formerly hiring their service. The state is losing revenue while the shippers are put to annoyance and expense. Yet the railroads have failed to attain their objective—the return of this tonnage to the rails.

3. Increased taxation.

All vehicles can be reached with increased taxes, weight taxes, ton mile taxes, gasoline taxes, or permits.

The National Association of Railroad and Utility Commissioners stands sponsor for a proposed state law which would require permits of private operators—the 86 per cent!

Kansas imposes a special tax on all private trucks operating beyond a 25-mile radius of cities.

The for-hire truck may be in the first line trenches, but can the ordinary, privately owned vehicle be far behind when the tax "push" is launched!

Specifications for Liquid Asphaltic Road Materials

Newly-simplified specifications for Liquid Asphaltic Road Materials as recommended by The Asphalt Institute have been developed as the result of numerous conferences with representatives of the United States Bureau of Public Roads and the various state highway departments, and supersede former Specifications Nos. 1 to 7 inclusive of The Asphalt Institute. They have been prepared to conform with the simplified scheme of analysis developed at these conferences, and cover the great bulk of satisfactory products which are now being furnished by the producers for various classes of highway treatment and construction.

Copies may be obtained without charge, upon request to The Asphalt Institute, 801 Second Avenue, New York, N. Y.

Authority for Federal Aid

Did you know that authority for appropriations for Federal Aid is embodied in the Constitution of the United States?

Following is abstracted from Article I:

Sec. VIII. The Congress shall have power—

7. To establish post offices and post roads.

A BRIEF Regarding the RAILROAD-HIGHWAY TRANSPORTATION CONTROVERSY

Public is entitled to the benefit of the most economical and efficient means of transportation of commerce by whatever instrumentalities may be economically suited to such purpose. No legislation should be attempted which has for its purpose the stifling of any legitimate form of transportation.

PERHAPS no other national organization has consistently kept in as close touch with the problems of the railroads as has the National Industrial Traffic League. This is but natural since the membership is made up of those representatives of all classes of industry whose duty it is to see to it that their principals may obtain the most efficient transportation available. Industries engaged in the distribution of their products through wide areas are confronted with many problems quite similar to those which face the railroads. This article is an abstract of a supplemental statement submitted to the National Transportation Committee on December 9, 1932, by the National Industrial Traffic League with whose permission it is used.

The Present Difficulties of the Railroads Are Due Primarily to the General Business Depression

Practically all students of transportation are agreed that the primary difficulties of the railroads are traceable to the general decrease in the movement of commerce. An exception should be made to this statement with respect to passenger transportation. There has been a progressive decline in passenger transportation for the past twelve years and this phase of the railroad problem is perhaps the most difficult of solution. So far as freight traffic is concerned, no matter what the policies of regulatory law may be, the railroads as a whole cannot prosper unless industry as a whole is in healthy condition.

The full force of the depression on industrial distribution had not been felt by the railroads until the present year, although 1931 was one of the worst years in their

WHO AND WHY of NATIONAL TRANSPORTATION COMMITTEE

The National Transportation Committee was created in September, 1932, by a group of representatives of savings banks, insurance companies and other institutions for the purpose of making a general investigation to determine what should be done to improve the condition of the railroads. Ex-President Calvin Coolidge was appointed as chairman, Mr. Barnard M. Baruch of New York City, vice-chairman, Messrs. Alfred E. Smith of New York City, Clark Howell of Atlanta, Georgia, and Alexander Legge of Chicago, Illinois, as members. The committee selected Dr. Harold G. Moulton, a distinguished economist who is at the head of the Brookings Institute of Economics in Washington, D. C., as its adviser and for the purpose of conducting the investigation to make a general survey of all of the problems of transportation and to develop both sides of the question. To this end Dr. Moulton was furnished with a staff of assistants, and numerous organizations throughout the country were invited to submit their views and attitude to the committee.

history. In his address to the annual meeting of the stockholders of the Baltimore & Ohio Railroad Company on November 21, 1932, President Willard stated:

"... It is a mistake to think that the chief loss in freight business to the railroad is due to the competition of that (the motor truck) particular agency of transportation. The main cause for the decline in freight traffic over the Baltimore and Ohio is to be found in the unprecedented decline in business, which for the country as a whole, at the present time, is about 50 per cent below normal."

A number of other recognized authorities have made similar statements. A recent analysis was published in the April 1, 1932, issue of *The Analyst*, which graphically showed a comparison of the volume and trend of railroad freight traffic with the volume and trend of industrial production from 1890 to March, 1932. Commenting on these analyses, the following conclusions were properly deduced from the computations shown:

"The most striking aspect of the relationship between

the two curves is, however, their close parallelism during the present business depression. Up to 1929 there were intermittent complaints about truck and pipeline competition, but it was not until the present depression was well under way that the subject received its greatest emphasis.

"The fact remains, however, that the present decline in freight traffic is being caused primarily *not by competition from other form of transportation, but by the depression itself*, and that in this respect *the railroads are no worse sufferers than the run of industrial companies.*

While the railroads have lost a substantial amount of traffic to competitive transportation agencies, no analysis has yet been made to show the net effect of such loss

the apparent volume of highway truck transportation that their mental processes border upon a state of panic when they contemplate the subject.

There are several aspects of the problem to be considered other than the mere determination of the amount of traffic which would have moved by railroad had there been no trucks. While these will be later enumerated, it is well first to get some idea of the nature and volume of the competitive traffic. Reference has already been made to the parallel between industrial production and railroad tonnage. One of the most recent studies bearing upon this subject was put out by the Interstate Commerce Commission in November, 1932. The study was prepared in graphic form.

On the graph the history is given of particular classes of commodities from which it will be seen that in the cases of bituminous coal, iron and steel and cement the railroad tonnage and the railroad revenue have closely paralleled the production throughout the period. These are commodities in which there is very little movement by truck and all of them are very important in volume and revenue to the carriers. In the case of cotton and live stock the railroad tons and railroad revenue have declined in comparison with the marketings.

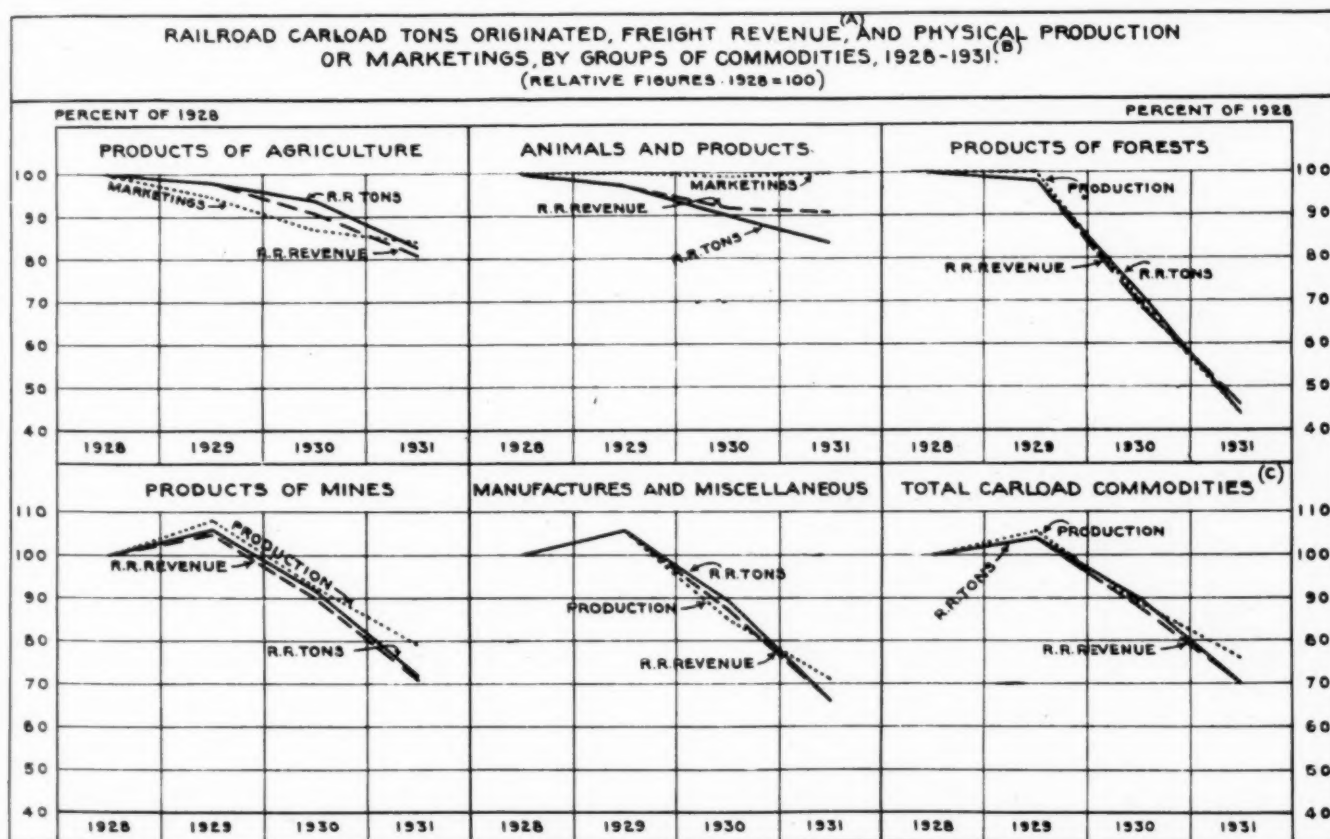
The extent to which interurban commerce has passed from the railroads to the trucks is necessarily a matter of conjecture. All statements upon the subject are necessarily estimates and are frequently colored by the prejudices of the author. There is no doubt that many railroad officials have become so aroused over

In a report made by the Car Service Division of the American Railway Association, November 11, 1932, a comparison of carloads was shown for the first 41 weeks of each of the past three years covering the period from January 1 to October 15 of each year. Comparing 1932 with 1930 it is significant that the greatest proportion of decline in car loadings has been in the case of those commodities which do not move by truck.

While the graphs referred to show a substantial falling off in railroad tonnage and revenue in two or three items, such as cotton and livestock, it must be remembered that these compose a very small proportion of the total tonnage and revenue received by the railroads. Cotton is not strictly carload traffic but moves generally upon less than carload rates, and the livestock rates for the short hauls are so low that it is very doubtful if the railroads derive any profit from such transportation. Within the past three or four years very large proportions of the short haul movement of livestock have been transferred to the trucks and doubtless will never return to the railroads, who should not mourn the loss.

On the other hand, cotton traffic would be a profitable traffic if it were handled in an economical way. The southern railroads have persisted in following an antiquated and wasteful method of handling the cotton traffic, as a result of which the operations were exceedingly expensive and the return doubtful. The advent of the truck is rapidly compelling the railroads to resort to the publication of carload rates on cotton and the elimination of many wasteful and costly services.

To the average person living in the cotton belt it would appear that the railroads had lost all of their cotton tonnage and it is a fact that a very large part of it has



One of the Charts in the Graphic Study to Which Reference Is Made

A. Freight revenue by commodities (not available before 1928) is given along with tonnage because it takes account of the fact that long haul tons are more important than short haul tons.

B. The Marketing indexes of the Department of Commerce and the production indexes of the Federal Reserve Board have been converted to a 1928 base taken as 100.

C. The "total" indexes for the three series were obtained by weighting the indexes for the five groups according to their average railroad tons, 1928 to 1931. However, within each group the elements in the marketing and production indexes have not been weighted to correspond with their importance in railroad traffic.

gone to the trucks within the past three or four years. However, this never amounted to such an important proportion of railroad traffic or revenue as many seemed to believe. For example, in 1928 the cotton traffic comprised only .27 per cent of the tonnage handled by the Class 1 railroads of the United States.

One of the most illuminating surveys which have been undertaken to develop the conditions relating to the competition between motor trucks and railways and the traffic handled was conducted in trans-Missouri-Kansas territory in 1932 by the Shippers' Advisory Board for that region. The questionnaire was developed and sent out to representative commercial houses and manufacturers and 385 satisfactory replies were received, which represented a typical cross-section of the industry in that general territory. The results of this survey were published in the *Railway Age* for the issue of November 26, 1932. For the period covered, 94.8 per cent of the tonnage shipped and received was by rail, 3.2 per cent was by private trucks, 1.2 per cent by contract trucks, and only .8 per cent by common carrier trucks. As determining factors in inducing shippers to patronize trucks, it was ascertained that in 78 instances it was because of the packing requirements being less stringent on the trucks, in 140 instances it was because of quicker service, in 89 instances it was because they could obtain store door delivery, in 60 instances it was because of the classification rules maintained by the railroads, and in 116 instances it was because of cheaper rates. In the latter case it is not clear whether or not cheaper rates by truck took in consideration the cost of store door delivery in the case of movement by railroads. In 104 instances the trucks were used at the request of the consignee.

At a hearing before the Interstate Commerce Commission in September 1931, the Director of the Bureau of Railway Economics gave detailed testimony embodying an estimate of the maximum commercial interurban tonnage that could possibly be handled in the course of a year by the motor trucks then available and it was his estimate that this would amount to only $7\frac{1}{2}$ per cent of the aggregate revenue rail tonnage of Class 1 carriers handled in 1930. In making this estimate he assumed that all trucks would be loaded to capacity on all loaded trips and would be loaded three-fourths of the time, a condition which of course could not possibly obtain. Various estimates which have been made as to the percentage of all interurban commerce being handled by motor trucks vary from 3 per cent to 6.8 per cent.

Prior to 1931 motor truck competition was largely confined to less-than-carload merchandise traffic and certain high grade carload traffic, but within the past two years there has been a substantial development of motor truck competition for carload traffic of various kinds. In some cases very low grade traffic is being handled in substantial quantities by motor trucks. For example, it has been found that sand and gravel can frequently be more economically handled by motor truck for short hauls than it can by railway. Wherever the movement of the commodity can be made direct from quarry to the point where it is to be used by motor truck, and such point of use is not directly available to carload service, the expense of the through motor truck operation is largely offset by the expense of the necessary motor truck operation in transferring the material from the rail terminal to the point of use. This has also accounted for a substantial movement of anthracite coal by truck and instances are cited in various sections of the country of movements of various agricultural products for substantial distances by truck.

The movement of fruits, vegetables and dairy products by truck has developed to a substantial degree, due at

least in part to the fact that the terminal delays under railroad operation render the rail service much less expeditious.

The history of the development of transportation of refined petroleum products by highway is an interesting commentary in itself. The petroleum industry had equipped itself with some 200,000 tank cars for the movement of gasoline and other petroleum products. The majority of the refiners preferred to patronize the railroads in the distribution of their product, but the level of freight rates which had been maintained by the carriers or which had been approved as maximum reasonable rates by the Interstate Commerce Commission, made the distribution of the products so much more expensive than it could be accomplished by means of motor trucks that appeals were made to the railroads in all sections of the country to reduce their rates to a competitive basis. In some instances reductions were made by the railroads, which did dispense with the necessity for the refiners to change their methods of distribution, but in the great majority of instances over the country the railroads refused to reduce the rates and in some sections undertook to make further advances in the rates in the face of the obvious danger of losing the traffic.

So many factors have operated to increase the movement of freight by motor trucks within the past two years that it is impossible at this time to determine with any degree of accuracy the total amount of such transportation. Of course it is obvious that a substantial portion of such transportation is of traffic which would not move by the railroads under any circumstances, but here again there is no up-to-date analysis available upon which dependable conclusions can be reached.

It has already been shown that truck transportation constitutes but a small proportion of the total interurban commerce of the country and that it is not likely that trucks will be able to handle any very large proportion of such commerce under the present plans for highway development. In an address before the Chicago Traffic Club on November 21, Mr. John R. Turney, vice-president of the St. Louis Southwestern Railway Lines, made the following comparison of haulage costs between railroads and trucks:

"The line haul cost per loaded car per mile of American railroads is 15.7 ct., or equated for empty haul, 10 ct. per total car mile for an average load of about 50,000 lb. The line haul cost of trucks including operation, maintenance, investment, depreciation, taxes and overhead expenses, but excluding terminal expenses, is between 15 and 20 ct. per vehicle mile. Due to difference in state laws and regulations as well as lack of data, it is not possible accurately to compute the average truck load. If the load is 25,000 lb. the line haul cost of moving a carload by truck is between 30 and 40 ct. per equivalent freight car mile. If the average be 15,000 lb. the equivalent car mile cost rises to between 50 and 75 ct. The line haul cost of a carload of freight per mile is, therefore, at least 20 ct. per mile less than that of the truck. In a haul of 200 miles, this difference aggregates \$40.00 per car."

As will be later shown in connection with the subject of taxation, the average cost in taxes and license fees to the ordinary common carrier truck is perhaps greater in amount per ton mile of freight handled than the entire cost per ton mile to the railroads. In a recent study made of the Louisville & Nashville Railroad Company and the principal states in which the company operates it was found that the total freight cost per net revenue ten miles for the year 1929 was 6.51 mills, which included all expenses of every character whatsoever. Taking a 3 ton common carrier truck, the study indicated that the average cost of license fees, registration fee and gasoline taxes for the six principal states in which the railroad

company operated, would amount to 10.5 mills per net revenue ton mile.

In the recent study made by the Department of Commerce in its Bulletin No. 66, published in August, 1932, a study of the operations by 91 trucking firms showed an average gross expense per truck mile of 26.64 ct. for trucks with rated capacity of $1\frac{1}{2}$ to 3 tons, 35.18 ct. for trucks with a rated capacity of from $3\frac{1}{2}$ to 5 tons and 38.3 ct. for trucks with a rated capacity of over 5 tons. Figuring the ton mile costs from the above figures it would be seen that they run from 8 ct. to 15 ct. per ton mile. In the study in question the direct operating costs constituted approximately 60 per cent of the total costs. Even the direct operating costs are vastly in excess of the average cost to the railroads for handling freight. The average revenue received by the railroads per net ton mile is slightly in excess of 1 ct. and has never reached 1.3 ct. per net revenue ton mile for any year.

While it is true that trucks generally handle traffic upon which the railroads enjoy the highest ton mile earnings, nevertheless it does not follow that such traffic is most remunerative to the railroads. One of the most prosperous years the railroads ever had was 1916, when they had about the lowest ton mile earnings in their history. On the other hand, one of the worst years they had was 1921, when their ton mile earnings were the highest in their history. Some of the most prosperous railroads in the United States have the lowest average ton mile earnings. This of course is due to the fact that they handle a large volume of low grade heavy traffic and such roads will feel little or no effect from competing forms of freight transportation.

A large portion of truck competition is for traffic which is most expensive for railroads to handle and is in a field where the trucks offer the more efficient and economical service.

In undertaking to ascertain the field in which truck transportation is more economical than railroad transportation, we are hampered by the lack of data to show what such transportation costs the railroads. The experience of various trucking companies has fairly well demonstrated the costs of trucking operations in given areas, but the failure of the railroads to

maintain any system of cost accounting renders it impossible for us to make any adequate comparison. It has long been recognized that less than carload merchandise service is by far the most expensive service that the railroads perform. Where tests have been made to determine the cost of such service the conclusion has been reached that because of the excessive cost of terminal handling the short haul traffic of this character is unremunerative.

The first general test of this character was made in Texas in 1914 in connection with the celebrated Shreveport Case, the result of which is reported in 41 I. C. C. Rep. 91-93. One of the latest tests was made in connection with the Western Trunk Line Class Rates Case, which was decided by the Commission in May, 1930, and the result of that test is shown in part in the Commission's decision in 164 I. C. C. Rep. P. 94. In the latter case it was shown that the out-of-pocket terminal cost of handling less than carload freight was in excess of 32 ct. per hundred pounds. The maximum fourth class rate fixed for the first five mile haul in that case was $17\frac{1}{2}$ ct. per hundred pounds. Working out an equated basis from the tests it was concluded that the rates for the initial haul, in order to clear the terminal cost would have to range from 26 ct. for fourth class to 43 ct. for first class. With large and expensive terminals, such as those located at Chicago, New York City, St. Louis and other major industrial centers are taken into considera-

tion, it appears to be obvious that even upon the basis of rates fixed as maximum rates by the Interstate Commerce Commission, prior to the advent of truck competition, the railroads cannot realize any profit for less than carload merchandise handled for the first one hundred miles.

On the other hand, it is this class of traffic where the expedition and resiliency of truck service makes possible more efficient distribution than can be obtained by use of the railroads. Some of the railroads have undertaken to meet the truck competition in this class of traffic by instituting pick-up and delivery service, which merely increases the railroad expense without any corresponding return in revenues.

It is realized that the mere fact of unequal competition does not relieve the railroad from the difficulty encountered in this less than carload traffic. So long as the railroad has to hold itself out to perform this class of service it necessarily has a large amount of overhead attributable thereto, yet the reduction in the amount of traffic merely increases the cost per unit of traffic and the consequent loss to the railroads. The only place this loss can be made up is by increasing the charges to the carload shipper who operates in the field of transportation where the railroads can function more economically than the trucks. If the railroads could retire from short haul less than carload distribution service and leave this field entirely to the trucks it is quite likely that they would be substantially better off in the net revenues realized from their operations. Either they must retire, or they must resort to the use of the trucks for the distribution of such traffic, or else they must continue to suffer an increased loss because of the fact that their service is inferior to that of the trucks.

There is no doubt but that the delay and heavy expense incident to the terminal handling of carload freight in all large railroad terminals has the effect of driving the movement of some carload commodities to the competitive means of transportation. Concerning the delay incident to terminal carload service and recent experiments of The St. Louis South-Western Railway Company with the use of trucks for terminal delivery of carload freight, Mr. Turney of that company made the following significant statements:

"In large industrial districts, such as Chicago and St. Louis for instance, it frequently takes as long to get a car into a train, as it does to move it 400 or 500 miles in line haul service. So long as we cling to switch engines and cars, this delay in large part will continue unavoidable. . . .

"On the other hand, the truck, not so handicapped, keeps moving all the time and upon arrival drives directly to the consignee's door, delivering the goods in less time than it takes to classify the rail car."

There is no foundation for the contention that the motor trucks do not pay adequate compensation for the use of the highways.

There is no phase of the subject of highway transportation upon which there has been more misrepresentation by railroad propagandists than the question of compensation for the use of the highways. Even at this late date we frequently see statements made to the effect that the railroads

are taxed to provide the highways and the motor trucks are permitted to use them without cost. It is true that at the inception of interurban motor truck transportation we [The National Industrial Traffic League] had generally followed a policy of resorting to general taxation to provide highways as avenues of commerce. Within the past ten years there has been a complete reversal of this policy so that today we find that in many states the motor truck is the most over-taxed agency in existence,

the taxes being levied not only for the maintenance of the highways but for numerous other governmental purposes. Due to the fact that each state determines its own policies of taxation and that in most states there has been no scientific study made to determine what would be a proper compensation to be paid by the trucks for the use of the highways, there is a tremendous variation in the rates of assessments which are made to compensate for the use of such highways.

There are four or five common errors committed in analyses made of this subject by various agencies. First, *they fail to determine what is the true cost of the highway to be returned from year to year and charge the capital outlay for the construction of the highway as though it were a current expense of operation.* Second, *they under-estimate the life of a highway, making the estimate upon that particular part of the highway which has the shortest life.* One table which has been given widespread publicity by the carriers estimates the over-all life of an improved highway at ten years, which is manifestly erroneous and absurd. Third, *they confuse the state highways, which are the avenues of interurban transportation, with the local rural roads, which never were and never will be thoroughfares for commerce which is competitive with the railroads.* Fourth, *it is assumed that the investment in pavements and maintenance of pavements on city streets should be charged to interurban highway transportation.* And fifth, *inadequate consideration is given to the portion of highway investment and maintenance which should be allocated to other public uses than those of private transportation.*

(1) *Distinction Must Be Made Between Capital Expenditures and Current Expenditures.*—In 1931 the various states collected \$537,589,717 in gasoline taxes and as registration fees they collected \$271,178,788 and in other miscellaneous license fees they collected \$37,180,537. These together with certain other incidental fee collections aggregated more than \$850,000,000. The total amount expended for maintenance of state highways by all of the states last year was \$160,980,079. During the year there was expended for state highway construction \$730,954,832. Practically all of the improved interurban highways have been constructed since 1914. From 1915 to 1931 inclusive the total outlay for state highway construction, including rights of way, aggregated approximately \$5,500,000,000. By far the greater proportion of this expenditure was for construction of permanent highways which would last for twenty to fifty years. Many of the railroad propagandists would charge this entire expenditure as though it were an operating expense of the current year and to the extent that it is not paid during the current year by the fees, assessments and gasoline taxes against the motor industry, it is claimed that there is a subsidization.

A striking illustration of this fallacy may be found by reading a so-called analysis published by the economist for the Association of Railway Executives in the *Railway Age* on August 13, 1932, and circulated in pamphlet form over the country. The economist shows that for the year 1930 state highway systems received \$701,420,591 from fees and gasoline taxes paid by the motor industry. He shows that the total receipts from all sources are more than \$1,100,000,000 including some \$26,000,000 of expenditures on Federal highways in national parks and the Mount Vernon Memorial Bridge and Highway (which can hardly be classed as avenues of interurban commerce competitive with the railroads). Nowhere in his article does he show the analysis of the expenditures upon state highways. He shows that over \$220,000,000 was realized from the sale of state highway bonds and notes but he completely overlooks the

fact that this money was raised to construct highways that would have a life of from twenty to fifty years.

The same authority from which the figures were obtained by him shows that in 1930 the total expenditure for maintenance and repair of state highways, including administration and engineering expense and material and supplies, was \$191,683,477. The motor industry therefore contributed nearly \$510,000,000 above the amount necessary to maintain the highways for that year. The same authority shows that there was expended for new construction and rights of way, during the same year, \$713,117,045. A substantial proportion of this was for structures such as steel and concrete bridges, which would have an estimated service life of from fifty to one hundred years, and all of the expenditure was for permanent improvements which would last for many years. Yet according to the theory of this railroad economist every cent of this should have been charged against the motor industry for the particular year in which the permanent improvements were constructed. Upon this theory he reasons out that the motor industry is not paying its proper share of highway costs.

The same criticism is made of his analysis of expenditures on local country roads. According to his own figures, the motor industry paid into the funds for maintenance of these local roads during 1930, \$162,021,831. But no analysis whatever is made of the expenditures upon such class of roads although it is well known that much of the expenditure here was for improvements of a permanent character.

The proper interest and sinking fund allowance should of course be added to the bill which should be paid by the motor industry for the use of the highways. In the year 1930 more than 82 per cent of the total expenditures for maintenance, new construction and reconstruction of state highways was from funds raised from gasoline taxes and various kinds of motor vehicle fees. Even in the case of the local rural roads, 23.5 per cent of the expenditures were from such sources. Of the remaining expenditure for state highways in 1930 more than one-half came from Federal aid, but *the Federal Government has already collected far more in excise taxes on motor vehicles, on parts, and on gasoline, than it has expended from the beginning to aid state highways.* Up to and including 1930 the Federal Government had collected in excise taxes levied on motor vehicles and parts more than \$300,000,000 more than it had expended up to that time in aid of state and national highways. It is estimated that the present Federal gasoline tax alone will produce \$138,000,000 per year.

If the railroads of the country should be called upon to pay as much for the use of their rights of way as it costs the common carrier motor trucks, the commerce of the country would be paralyzed by the increase in freight rates which would be made necessary and the railroads would no doubt go into bankruptcy. In a study of the Class 1 railroads of the United States for 1927, the Interstate Commerce Commission estimated that approximately 67 per cent of the total cost of road and equipment as shown by the carriers' records should be assigned to the cost of road, rights of way and structures. Based upon their investment accounts for 1931 this would result in a total investment in property other than equipment of \$17,111,526,640. The total cost of maintenance of way and structures for the same year under the I. C. C. rules as related and apportioned to freight service and other services, except passenger service, was \$379,949,848. Assuming that the railroads paid the same proportion of tax upon the equipment as they did upon their other physical properties, the taxes paid to states and their political subdivisions for roads, rights

of way and structures amounted to \$196,532,080. These railroads handled 959,666,000,000 gross ton miles of freight and equipment.

It will be seen that the out-of-pocket cost to the railroads for maintenance of way and structures and for taxes thereupon amounted to approximately .6 mills per gross ton mile of freight and equipment handled. However, the true cost of the railroad properties should include some figures for return upon the investment. If we figure 5 $\frac{3}{4}$ per cent return upon the investment we would add \$989,912,782 to the bill and in such event the total cost including the full return would be 1.63 mills per gross ton mile. If this be reduced to a basis of net ton miles of revenue freight handled it would be 4.63 mills.

On the other hand, the taxes and assessments paid to the state for use of right of way by the common carrier truck per gross ton mile or per net ton mile, was vastly in excess of the roadway cost to the railroad. Taking a three ton truck as illustrative, and assuming that it is loaded to three tons capacity three-fourths of the time, including both going and return hauls, and that it operates 25,000 miles a year and obtains eight miles of transportation per gallon of gasoline consumed, the average tax cost, including registration and license fees, would be 2.62 mills per gross ton mile. If reduced to the basis of net ton mile of freight haul, the cost would be 7.27 mills. This computation is perhaps substantially less than the true average cost, taking the United States as a whole. For example, it is assumed that the truck would be loaded to its rated capacity for three-fourths of its total haul, whereas in the investigation conducted by the Interstate Commerce Commission (I. C. C. Docket 23,400) it was assumed that two-thirds would be a fair estimate and that the vehicle would only be loaded to 80 per cent of its capacity for the loaded haul mileage. The estimate of eight miles to the gallon of gasoline is based upon the operation of a new truck, whereas for trucks which have been in operation a substantial period of time the gasoline consumption is relatively higher.

Mr. John R. Walker, statistician for the American Automobile Association, made an estimate of five miles to the gallon for three-ton trucks. The recent surveys made by the Department of Commerce show that the average annual mileage of common carrier trucks is substantially under 25,000 miles and the Western Traffic Survey conducted by the Bureau of Public Roads in eleven Western states showed an average of 22,476 miles. As a matter of fact the total cost per gross ton mile and per net ton mile of hauling freight by Class 1 railroads of the United States for the year 1931, including the entire transportation cost and the overhead, amounted to 2.62 mills per gross ton mile and 7.44 mills per net ton mile, which was no more than the average tax cost paid by the common carrier motor truck for the use of its right of way.

The foregoing figures, given with respect to state highway costs, relate to the so-called systems of through state highways, of which there were approximately 349,000 miles on January 1, 1932. Most of these are improved highways and parallel to a large degree the 186,000 miles* of railway in the United States. They are the highways which are competitive with the railways. There is a much greater mileage of local country roads radiating for a few miles out of every town and hamlet, only a small portion of which are improved and upon which very little interurban commerce is moved.

In a recent survey made in the state of Michigan it was ascertained that 65.7 per cent of all motor vehicle

traffic moved over 9 per cent of the road mileage, the latter being state highways. The traffic upon the local rural roads is predominantly local rural traffic, while that upon the state highways is in large part interurban traffic. However, *there is a very substantial portion of commercial traffic from the state highways which is suburban traffic of a character which would not under any conditions be handled by the railroads.* For example, within a radius of a few miles of the city limits of any city of considerable size there are suburban residential and industrial districts which are served by delivery wagons and trucks in the same way as metropolitan areas are served.

(2) *Improved Highways Are Permanent Structures With Substantial Service Life.*—With reference to the theory that, to keep the life of the bonds within the life of the investment, "one-tenth of outstanding bonds should be paid or retired each year," any assumption that highways of the character constructed with bond funds have a life of only ten years is not supported by present-day highway engineering authority. On the contrary, the Bureau of Public Roads has made certain analyses and studies of the mileage of state highways that have received federal aid. There were about 70,000 miles of such highways aided up to the close of 1928 that were involved in such study. A substantial part of the cost of these roads was for objects other than the construction of surfaces such as roadbed and drainage structures that have a relatively long life. For example, 70 per cent of the cost of construction of sand-clay roads went into such relatively permanent works as grading, drainage structures, bridges and culverts, all of which are considered as having an ordinary life that can be safely estimated as exceeding 50 years. In the case of the gravel roads, grading, drainage structures and bridges constituted 49 per cent of the total cost.

In the total aggregate of roads of all types, it was estimated that not less than 40 per cent of the total cost went into grading, drainage structures, bridges and culverts.

Moreover, in the case of surfaced roads, there are numerous hard-surfaced roads that have been carrying heavy traffic for twenty years, and therefore it cannot yet be estimated just what the life of a paved road is. The life of the surface of ordinary gravel and sand-clay roads will depend largely upon the character of maintenance, but even when the surface wears out there is a substantial part of the value thereof that may be incorporated into the base for a new superstructure.

In view of these findings, the mere wearing out of the surface is no proper criterion by which to determine the life of the road as a whole, when the surface constitutes only one of the elements of its construction.

There has been tremendous progress in highway engineering within the past ten years, and it may safely be said that the average type of state highways being constructed today should have a substantially longer life than those that were constructed in the early days when the development of the automotive traffic was still in an experimental state and many of the highway problems were then unknown.

(3) *State Highways versus Local Rural Roads.*—One of the statisticians whose charts and figures have been widely circulated by some of the railroads has undertaken to demonstrate that the greater part of the cost of the highways which furnish railroad competition become a charge upon the general taxpayer. This is done by assuming first that the highways have a life of only ten years and that one-tenth of all outstanding bonds must be retired each year; and second, by combining all local rural roads with the state highways. Since the

*Owned mileage by Class 1, 2 and 3 railways.

latter have always been primarily maintained by local general taxation the picture is made to reflect a heavy charge upon the railroads and other general taxpayers for the maintenance of thoroughfares for use of their competitors. Without undertaking to go into any detailed analysis of such showing, it should be stated first of all that there are approximately 2,600,000 miles of local rural roads and that in 1930 57.75 per cent of the cost of constructing and maintaining local roads came out of general taxes. On the other hand, only 1.31 per cent of the total expenditures for state highways was derived from general taxation. In 1931 this figure was 1.41 per cent. Since 1923 the proportion of state highway expenditure which has been derived from general taxation has steadily declined from 7.79 per cent in that year to a low point of 1.31 per cent in 1930.

(4) *The Cost of Paving City Streets Is Not a Proper Charge Against Interurban Highway Transportation.*—Reference has already been made to an article by the economist for the Association of Railway Executives undertaking to prove that motor vehicle taxes do not and cannot produce sufficient revenue to pay the road bill. This authority has ascertained that there are some 260,000 miles of city streets upon which within the past several years there has been expended several billion dollars for pavement, operation, maintenance and interest charges, and he finds that only about 3 per cent of this total cost has been met by charges against the motor vehicles. By casting this enormous sum into his equation he reasons that the actual users of the highway pay only 18 per cent to 20 per cent of what they should pay to meet highway costs.

In every city there are a few streets which form the principal avenues for traffic which passes over the state highways to other towns and cities, but these streets comprise an infinitesimal percentage of the total mileage of city streets. Furthermore, the very fact that they are important avenues of traffic renders the property abutting upon such streets more valuable and for many years nearly all cities in the country have recognized the justice of imposing upon the abutting landowners all or a part of the expense for paving the streets in front of their property, for the simple reason that such improvements enhance the value of the property much more than the mere cost of the improvements.

The National Municipal League is a recognized organization of representatives of American municipalities and deals with tax and other problems for the information and benefit of its members. The League has long recognized the justice and propriety of imposing the cost of paving city streets upon the abutting owners, subject of course to obligation of other instrumentalities to bear a portion of the cost. For example, in many cities the cost of paving the intersections is paid out of the general tax funds, whereas in others the cost of the intersections is apportioned between abutting owners and public service companies which enjoy valuable franchises to use the streets.

In a report issued by the League in 1929, the following statement is a recognition of the propriety of such a policy:

"A well-planned and efficiently constructed public improvement confers a benefit upon the community at least equal to its cost. This benefit is seldom distributed evenly over the entire city. In almost all cases certain localities benefit far more than others from the improvement. It is therefore only fair to ask the specially benefited areas to make special contributions to meet the costs involved. Any other policy results in a special benefit to some at the expense of the entire community."

In the same report it is stated that practically three-fourths of all cities in the United States with population

in excess of 30,000 assess either all or a portion of the cost of pavements to the property benefited and that approximately one-half of all cities assess the entire cost to the abutting owners. The railroads would assess the entire cost against the motor industry.

(5) *Recognition of Other Public Uses of Highways.*—Few people stop to consider all of the social and economic benefits which result in whole or in part from the construction of public highways. Some of the railroad propagandists are making appeals to the private automobile owners by arguing that public highways are not intended to be avenues of commercial transportation. For example, the economist for the Association of Railway Executives says that the highways are improved "for the comfort and convenience of travel and communication by means of the private passenger automobile" and that "the operation of a private passenger automobile is not an economic operation." Such implications are neither historically nor presently correct.

From the beginning of civilization highways have been developed as means for moving commerce and as avenues for travel by people engaged in business enterprises. Throughout the history of this country, until the last fifteen years, the public roads were uniformly regarded as economic enterprises which enabled the producers of agricultural and other products to take their goods to market and enabled the merchants to distribute their goods to the consumers. Highways were not considered as roads by which the farmers might go to town for pleasure or the merchants might go to the country on sightseeing expeditions. With the development of the passenger automobile and the improvement of the highways a very large proportion of the commercial travel which the railroads previously enjoyed is being conducted over the highways.

The 2,600,000 miles of rural roads still perform substantially the functions that they performed a generation ago. The state highways perform the same functions and in addition thereto they have become avenues of public travel on business, which is of course an economic operation, in spite of the railroad economist to the contrary, and they have also become avenues for private transportation of goods, and to a less extent for transportation of goods for hire, partly by contract carriers and a negligible proportion by common carriers.

The use of highways for postroads and as facilities of national defense has been long recognized. In the matter of police protection, fire prevention, promotion of recreation and education, they have become of primary importance to society. Through the development of school busses great economies in capital outlay for common school facilities are being realized.

The Federal Government has extended Federal aid to certain through highways, and this principle has been followed by seventeen years, during which time a substantial proportion of the initial cost of some 200,000 miles of through highways has been supplied from Federal funds. On the other hand, the motor industry has not only had to pay the same income taxes, ad valorem taxes and other taxes as the railroads paid, but in addition thereto has been taxed with heavy excise taxes which today constitute one of the important sources of income to the Federal Government. A balancing of the accounts will show that the industry has paid special taxes far in excess of the Federal expenditures for such purposes.

Federal regulation of motor trucks.

Every state in the union has passed various kinds of laws which regulate in one way or another the operations and service of motor trucks. In some states laws have

(Continued on page 68)

Motor Trucks, Milk and the Consumer

By HARRY E. SEANOR

Regional Vice-President, The White Company

MILK today is selling cheaper than it has for many, many years. It probably is the cheapest as well as the best food available. Motor truck transportation has played a most important part in the improvement of quality and in the lowering of costs to the consumer.

The coming of the paved highway literally lifted the cow out of the mud and made possible great dairy farms hours closer to the cities, providing better and fresher milk and economical transportation. The public benefited. Paved highways provided large central milk collection points, reducing by hours the time from the farm to the collection point by the farm truck instead of the horse-wagon and mud roads which, in winter season, were nearly impassable and oftentimes made shortages of milk in large centers. The paved highway, paid for by the public from motor taxes on passenger and commercial cars, brought about scientific development of milk transportation by motor trucks. This entire structure is today being endangered by increased taxation and restrictions that show no real consideration of the public's interest.

Under the belief that heavy taxation may bring business back to the railroads, strong forces are attempting to have laws enacted which will seriously injure motor transportation and increase the cost of milk by additional taxes and restrictions to motor transportation.

In the language of Al Smith—"Let's look at the records." Just a few years ago, rail transportation within a radius of 100 miles of Chicago cost 36 ct. for a hundred pounds of raw milk. Highway development made possible the use of motor transportation for milk hauling and a consequent reduction in cost to 24 ct. per hundred weight. Motor trucks were improved. The Illinois Legislature passed a constructive law permitting 40,000 gross pounds on a six-wheel truck which could haul a 32,000 lb. trailer, making a truck and trailer load of slightly over 4,000 gal. of milk. The six-wheel truck further reduced the transportation cost to 14 ct. per 100 lb. A new and more economic form of milk transportation had arrived. The railroads requested relief from the Interstate Commerce Commission and reduced the rail rate to 16 ct. per hundred weight or within 2 ct. of the then motor truck cost. New efforts were now made to regain the lost tonnage. It was too late. Less handling from farm to pasteurizer was provided by motor truck, cutting costs materially. Elapsed time from farm to bottling plant was greatly reduced, resulting in fresher product for the consumer. In the meantime, further improvement was made in motor trucks and equipment. Lighter, stainless steel tanks were tried out and proven successful; aluminum tanks were experimented with and proven successful; payloads of milk were increased from 4,000 to 4,875 gal. per truck unit and within the legal weight restrictions of state laws. Motor transportation costs were again lowered to less than 12 ct. per hundred weight of milk transported. Science had improved trucks, large balloon tires came into use on motor trucks, replacing solid tires and a consequent saving of the highways. Larger motors brought about faster speed, air brakes were developed, making faster speed safe and reduced traffic congestion on narrow paved highways. Ten wheels being equipped with air brakes instead of two wheels, as were the first

milk trucks. Milk trucks of the new type were equipped with snow plows and kept the highways open in winter for all motor travel. Rarely are these trucks delayed, regardless of conditions. During this period of three or four years, the retail price of milk in Chicago was lowered, first from 13 cts. a quart to 11 cts., then from 11 cts. to 9 cts. The lowering of transportation costs has played an important part in this.

Hospitals, babies, children and every one benefited. Prices on ice cream, cheese, butter and many milk products were lowered. All of this cannot be credited solely to motor transportation; their contribution to this end, however, was very material.

During this period of highway and motor truck improvement, the railroads also improved their milk handling equipment. The once familiar baggage car milk train was replaced with milk cars for express service, equipped with 6,000 gal. glass lined tanks. The station platform collection of milk cans passed out of the picture. This railroad advance also assisted in lowering transportation of milk to the consumer. Motor trucks assisted the rails, taking the milk from the farm to the rail tank car at central points of loading. While this improved rail service was outstanding, the motor trucks maintained their advantage of less handling and the expense incidental to handling. The railroad was stationary with the rails, the motor truck was mobile and made possible less handling and provided direct transportation service from the dairy farm to the pasteurizing and bottling plant in the city.

In the coming session of the Illinois Legislature, new efforts will be made to further hamper, restrict and tax motor highway transportation. It is to be hoped that the Legislature will insist on facts and not be led to hasty action by lobbyists, who have been so carefully coached that they all speak the same lines with the same pathos and the same dramatic appeal, at all the crossroads and way-stations of America. They will be careful not to reveal that motor trucks and busses in Illinois paid in taxation, license fees, gas, oil, tire, repair parts, new truck, personal, State and Federal Government over twenty-three million dollars in 1932. Regardless of the foregoing taxation, they will make the same old claims that trucks are furnished free highways. They will be careful not to point out the economies and service of motor transportation. They will tell the same government subsidized stories and cry regulation—more regulation—more taxes—more restrictions. It is not a pleasant story, but a very old one to the shipping public.

Special taxes paid by owners of trucks in 1932 exceeded the total tax paid by railroads on their freight and passenger operation and the total taxes paid by all highway users for the same period was four times the aggregate tax credited to all railroads. This challenge to motor truck owners must be met. 900,000 trucks on the American farms must be made to see this shackle on agriculture. 48,000 busses, nearly 50 per cent of all busses in America, are daily transporting school children to consolidated schools. Do the farmers and small villages want the consolidated school abolished? Isn't it about time to call a halt on lobbying interests for motor truck transportation strangulation? There is a distinct and definite sphere for railroad transportation and also for motor truck transportation on the highways.

Regulation must be in the public interest to promote highway transportation and not for the repression of trucks to further the interests of other carriers regardless of the cost to the public. The railroad and the motor truck can be of benefit to the public only as each is economically beneficial to the transportation of commodities used by the public. Each form will find itself ultimately and neither should be restricted to the public's detriment.

Much damage was done to motor transportation by laws that were enacted in the Legislative session in 1931. Millions of dollars of expenditure were forced upon Illinois truck users, which they could ill afford to spend under depressed conditions. The milk industry particularly was forced to make changes or replacements in motor truck equipment on account of the overall length being reduced from 65 ft. to 40 ft., obsoleting millions of dollars in motor trucks that had to be scrapped.

Why 40 ft. long overall? (truck and trailer). Was this restriction given any consideration as an economical transportation matter? Were any facts presented from an engineering standpoint that made 40 ft. the logical overall length? Possibly 65 ft. overall length was excessive, but few units were that long. (Not to exceed 200 truck units owned in Illinois.) Why not 60 ft. or 55 or 50 ft.? Was any survey or study made of overall length of trucks in existence, so that the enactment of a new law could be based on facts?

The law was enacted. The milk industry, the farmer and the public are paying the cost as milk transportation costs could have been lowered further if this restriction had not been placed on motor transportation.

Fairness will prevail in the end but organized paid lobbies must be restricted in justice to the great public interest that is involved in economic transportation, either by rail or highway.

A Brief

(Continued from page 66)

been passed providing for the regulation of the rates of charges by common and contract motor truck carriers. Through the exercise of the police power the several states have enacted restrictions limiting the width, height and length of motor vehicles and the amount of load, as well as the character of lights and safety devices which seem to the legislatures to be appropriate in the interest of public safety. Efforts are being made to bring about uniformity of such regulations and substantial progress has been made within the past two years along this line.

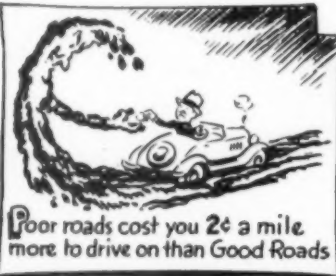
One difficulty with enacting Federal regulation of motor trucks handling interstate commerce is that a large part of the interstate service is within a short radius of the principal distributing centers. This is simply local delivery service in metropolitan areas or to suburban communities in the vicinity of cities which are near state boundaries. There are a large number of important towns and cities adjacent to state borderlines and it would not seem desirable to undertake to regulate deliveries in the suburban areas surrounding such cities. For example, such cities as New York, Philadelphia, Pittsburgh, Cincinnati, Louisville, St. Louis, Memphis, Washington, Kansas City, Omaha, and numerous others, are communities where the local merchants serve the surrounding territory by means of the same kind of delivery service which is used within the city limits. It would be almost an impossible undertaking to regulate the rates, charges and services of this type of transportation through a central commission located at Washington.

Due to the fact that highway transportation is carried on by hundred of thousands of operators, the mere task of classifying the character of the operations is in itself a considerable problem. Any attempt by the Federal Government to police any elaborate system of regulatory laws as applied to this form of transportation will require a much larger personnel than has been developed by the Government to enforce the Eighteenth Amendment, and no doubt the results achieved will be no more satisfactory. It is quite evident that any scheme of regulation by the Federal Government must be based upon cooperative action and regulation by the respective state governments. One difficulty today is that the state governments will not cooperate with one another in undertaking to bring about uniform regulation and policing of the traffic and it will of course remain to be seen whether or not they would cooperate fully with the Federal Government.

A number of public interests united in an appeal to Congress to enact a cooperative scheme of regulating automobile busses. It was thought that experiments made in this form of regulation might well point the way to possibilities of practical solution of other highway problems. The carriers are over-regulated at the present time and the enactment of similar elaborate regulatory machinery for operators of motor trucks will prove more impracticable than has such regulation of the railways. We [The National Industrial Traffic League] advocate various changes in the law which will give the railroads greater freedom to engage in highway transportation, to meet competitive means of transportation and to coordinate the rail services with highway and other competitive forms of transportation service.

I'm Telling You!

Despite our great road building program, our roads are still 4 times more crowded than the roads of Europe



Every dollar diverted from the Gas Tax means 90¢ LESS for LABOR



How will the roads in OUR state be kept in good condition if the road fund (gas tax) is grabbed for other uses?

HIGHWAY TRANSPORT

Its Importance As a Job Stabilizer

By M. L. PULCHER

President, Federal Motor Truck Co., and Member Motor Truck Committee, National Automobile Chamber of Commerce

THE jobs of 3,500,000 men are today at stake in the continued improvement, maintenance, and use of highway transportation. They are threatened by increased motor taxation, diversion of funds, opposition of other transport agencies and even the misunderstanding of friends.

One million men gain a livelihood from road construction and maintenance.

Two and a half million men are employed in the use and service of the motor vehicle, exclusive of its manufacture.

Road building has been one of the most effective means of relieving unemployment; at the same time providing a needed economic service.

Thousands of miles of new road surfaces have been added to our systems in the past three years. Many more thousands are needed, both in the improvement of existing types and in the extension of low-cost, secondary roads.

Millions Dependent on Motor Service.—Twenty-four million motor vehicles and more than 850,000 miles of surfaced roads are in use, providing a low-cost, individual service for our people.

It has been estimated that 15,000,000 persons have moved to the suburbs during the past decade. To them the automobile and the motor bus are a necessity for personal transportation.

Nearly a million farms depend directly upon the motor truck to market farm produce.

Five million farms count upon the motor vehicle as their present day horse and wagon. It is the only outlet for much farm produce dependent upon low-cost transportation.

Forty-five thousand common carrier busses operate over 367,000 miles of route to provide a low-cost passenger service.

Nearly 50,000 school busses travel half a million miles of route daily during the school year.

Trucks Render Essential Distribution Service.—Without trucks, one of the most valuable links in the chain of distribution would be missing.

Service to the home is the backbone of the use of our 3,500,000 motor trucks in the daily delivery of milk, groceries, newspapers, and mail; in the distribution of coal, building materials, laundry, dry goods, and a thousand other commodities.

Who Uses the Truck?—The output of high-powered propagandists opposed to motor transport conveys a picture of huge vehicles engaged in taking freight away from the railroads.

What are the facts?

Who owns the trucks and what are they used for?

There are 3,500,000 of these vehicles, and more than two-thirds of them are individually owned. The corner grocer, the tailor, the farmer, the florist, and the small town merchant own them.

But what of the big fleets?

They are used to serve you, directly and indirectly. The largest single fleet in the country—15,000 units—

owned by the American Telephone and Telegraph Company is used in maintaining your essential telephone service.

The next largest fleet, owned by the Standard Oil Company of New Jersey, delivers oil and gasoline to your neighborhood filling station or perhaps to your oil-burning furnace.

Then come the large milk companies, such as Borden, the National Dairy Products; the bakeries, such as Continental, Ward, General and National Biscuit; the meat packers like Armour, the Railway Express Agency; Standard Brands, the utilities like Mid-West, Consolidated Gas of New York, Postal Telegraph-Cable Company, and the highway department's.

Trucker in Thirty-fourth Place.—Not until we reach the thirty-fourth place in the list do we find a fleet engaged in commercial freight hauling.

It has been estimated that there are 23,000 motor truck fleets in the United States. Compare this with the fact that 86 per cent of the railroad mileage is controlled by 14 major railroad systems and you have a picture of the vital difference in control.

Motor Tax Bill \$1,085,000,000.—From these motor vehicles there was collected in 1932 the sum of \$1,085,000,000 in taxes.

Special taxes alone—registration fees and gasoline taxes—amounted to more than the wholesale value of all vehicles produced during the year.

All costs of vehicle operation are down save taxes.

The wholesale value of the average passenger car is down from \$882 in 1919 to \$720 for last year.

Wholesale tire prices are now but 21 per cent of the 1919 figure. Meanwhile the mileage per tire has trebled.

The average tax per vehicle has increased from \$8.68 in 1919 to nearly \$45 in 1932.

Increased taxation means decreased use or abandonment of the vehicle.

Vehicles Paying for Roads.—By means of this staggering total of taxes the motor vehicles are today largely paying all the costs of the main roads which they use.

Exceptional expenditures for new construction have been used to indicate that these taxes are inadequate. We cannot accept that basis of comparison as a fair one, but use rather an average for the past decade. Then, too, there has been a marked element of unemployment relief in these large expenditures.

Using average construction figures for 1930, special taxes on motor vehicles are now paying all the cost of the state highways and are contributing 21 per cent of the cost of county and local roads.

At the same time there was no state property tax for roads in 34 states during 1931.

Diversion Another Danger.—There is agitation on every side for tax reduction and tax relief, except for the motor vehicle. Other taxpayers hope to shift their burden to the motor vehicle, either by increased taxation or by diversion of motor taxes to general uses unrelated to roads.

Every dollar so diverted affects road employment di-

rectly. It jeopardizes the payment of highway bonds. It keeps the farmer in the mud. The motor taxpayer is not given a square deal.

No less prominent a figure than the Secretary of Interior, the Hon. Ray Lyman Wilbur, said recently:

"Why not boldly challenge the highways. Highways are extracting funds painlessly through gas taxes. . . ." "A billion dollars could be taken from roads and put into education," he asserted.

Mr. Wilbur as Secretary of the Interior, and chairman of the Conference on the Crisis in Education, reversed his position as chairman of the Federal Oil Conservation Board, which reported in October, 1932:

"Such uses (for the purposes other than roads) of funds derived from gasoline taxes are at variance with the purpose of the tax at its inception. Therefore, the fourth essential feature of a successful uniform gasoline tax law is that no part of the revenue derived from the tax shall be diverted to uses other than for the benefit of automotive motor vehicles."

Tax Reduction Before Diversion.—The motor user is as much entitled to tax reduction as any other taxpayer. Reduction of registration fees and gasoline taxes is a duty which has a prior right over tax diversion, however worthy the cause.

Temporary diversion, if permitted, will all too easily become a fixed feature of any tax program. If you don't believe it, may I suggest that you ascertain even a single instance where this has proven otherwise.

First Job Now One of Analysis.—With an increasing demand for economy in government and a desire on every side to use motor taxes for anything but roads it is more important than ever that our states and counties make doubly sure of which roads need improvement.

Unemployment relief cannot be lost sight of, but should not be charged to the motor user as his responsibility alone.

Additions to State System Equal Mileage Improved.—

The state highway systems, comprising about 12 per cent of all the highway mileage and carrying from 50 per cent to 75 per cent of the traffic are a little more than two-thirds surfaced. Now mileage from county systems is transferred to state responsibility faster than the state can build new surfaces.

In 1923 we had 250,000 miles in the state highway systems, with 140,000 miles unsurfaced. Today the total mileage is 350,000, with 100,000 miles yet to be surfaced.

On the county road systems estimated at 600,000 miles there is still 275,000 miles to be surfaced and of the remaining 2,000,000 miles of road but 165,000 has any surfacing. Much of this mileage probably never should be improved or only to a minimum degree.

Forty per cent of our farms, though, are still on unimproved earth roads.

Arterial highways through cities have been neglected under pressure to reduce expenditures.

There are the facts from which to start when anyone says the job is done.

Add to this a survey of the traffic over the roads and you have the answer as to the necessity for further road improvement.

In Michigan, for example, 66 per cent of the traffic moves over 9 per cent of the roads; 24 per cent over the county roads, which are 20 per cent of the total, and but 10 per cent of the traffic, or an average of 22 vehicles a day, moves over the township roads totaling 71 per cent of the rural highways in the state.

Not only do these facts give a clue as to the roads

which should be improved, but as to which ones the traffic should pay for.

Motors to Pay for Main Roads; Other Sources for Land Service Roads.—While there is an element of land service in the roads of general motor use, it appears likely that a practical solution is to apply motor taxes to payment of all the costs of these roads; leaving other sources of revenue to care for purely local land service highways.

Motor Taxes Able to Provide Reasonable Main Road Program.—Special motor taxes now collected if rigorously applied to road purposes, can sustain a reasonable main road program.

Existing highway bond requirements must be met first. Maintenance cannot be neglected.

Then comes the question of first improving, at least to a usable state, the main roads now carrying the most traffic and from that point proceeding to betterment of the greatest possible mileage.

The road dollar today buys a greater mileage than ever, but should not be stretched too far.

Road building and maintenance and road use go hand in hand.

Improved roads are essential to lower transportation costs over the road.

Lower transportation costs are vital in distribution today. They are possible through the motor vehicle and the highway.

Forty-five thousand communities depend upon the highway.

Highway Program Must Go Forward.—It is idle to speculate upon the elimination of the highway program. It cannot be done.

Some curtailment there may be. The danger, however, is that the highway program may be curtailed to permit diversion of motor taxes to other purposes. Such a course cannot but prove disastrous to any well-ordered highway program.

If justification were needed for a continuation of road building and maintenance, there is no better instance of its value than cited by the Secretary of Agriculture, the Hon. Arthur M. Hyde, recently:

"Our roads provide our only collection and distribution facilities. Their preponderant uses are local. Their use for the daily and continuous flow of agricultural products to markets has developed into an essential element of countless agricultural operations. The cost of such transportation must be kept at the lowest possible point to keep at the minimum the spread between prices paid the producer and prices charged the consumer. This is a tremendous element in the rate of consumption of agricultural products.

"In the problems which now arise through the marginal competition between the railroads and highways, the fact of the necessity of highway building, as such, must be dissociated from the limited use which is competitive. Proposals to impose higher taxes upon motor vehicles, particularly motor trucks, as a means of limiting competition with the railroads must be carefully scrutinized in the light of their inevitable principal use for the purposes of feeding to, and distributing from, the railroads, the goods hauled by the railroads.

"We are passing through a most serious period of subnormal business. In this whole field of highway administration, financing and operation, it is only by the most careful study of the facts and intensive research in these problems which are still in the formative stage that we can hope to protect our present investment and build policies of an enduring character."

Cost to American Public of Diversion of Gasoline Taxes and Motor Vehicle Fees from Their Lawful Purposes

By ERNEST N. SMITH

Executive Vice-President, American Automobile Association

THE Congress and forty-odd state legislatures are now in session and prepared to tackle problems of vital concern to the whole country. In these legislative bodies are about 7,000 members, many of whom are newly elected. Into the legislative hoppers will be thrown literally thousands of new and untried proposals. Some of these, if enacted, will have a most disastrous effect on the future of highway transportation.

The course we must now take is clear and well sign-posted: We must demand that the constant pyramiding of motor levies cease. We must demand that receipts from these taxes be limited to highway purposes. There is absolutely no justification for the assumption that motor vehicle owners, as a class of citizens, should bear the cost of benefits that accrue to all our people. And we must demand that our road building programs be placed on a sound and economical basis and that a dollar's worth of roads be given for every dollar collected in taxes.

Motor Tax Facts.—In order that we may appraise more clearly what tax diversion means to the car owners, let us look briefly at the motor tax facts as they stand today.

About this time every year we prepare at national headquarters of the American Automobile Association a chart giving preliminary figures on the valuation and taxation of motor vehicle property. It reveals some astounding facts. Here are some of them:

The number of registered motor vehicles has declined more than 2,250,000 since 1930 and the use of those in operation has been greatly curtailed.

Since 1930, the average tax per motor vehicle has jumped from \$37.72 to \$44.82, an increase of 18 per cent.

Highway users, as such, paid in 1932 12 per cent of all taxes, Federal, state and local. Their tax bill amounted to the gigantic sum of \$1,088,000,000.

It took the form of no less than 25 different levies and virtually every agency of government had a hand in imposing a toll on motor transport. No other single class of our citizens is subjected to such burdensome and discriminatory taxation.

On the basis of valuation, owners of motor vehicles in 1932 paid 24.1 per cent of the value of their property in taxes. In the course of seven years, the average life period of a motor vehicle, they pay in tax levies 168.7 per cent or more than 1½ times the value of their property.

More than one-half of the total tax bill consists of gasoline taxes, now ranging from 3 to 12 ct. per gallon. In some sections the combined Federal, state and local gasoline levies amount to a tax of considerably more than 100 per cent on the wholesale price of the commodity.

What is really happening is that the ownership of a motor vehicle has become a yardstick of taxability, but without any reference whatever to ability to pay.

The pyramiding of motor levies is, of course, encouraged by the legislative raids being made upon motor vehicle revenues for a variety of purposes.

Gasoline Tax Intended for Highway Work Only.—

When the gasoline tax was adopted by Oregon in 1919, the enacting law provided that the proceeds would be used for the purpose of construction and maintenance of a state highway system. Other state legislatures were soon attracted to this apparently fair and "painless tax," so they made a pledge with motorists to the effect that they would levy the tax and the owners of motor vehicles would benefit in the form of improved highways. The motorists sanctioned the tax and it was only a matter of a few years until it was universally levied and collected.

The growth and spread of the gasoline tax is without parallel in the whole history of taxation. In 1919, Oregon collected \$290,796 from the levy of 1 cent. In 1932, motorists of the country paid approximately \$600,000,000 in gasoline taxes, at rates varying from a 2-ct. state and 1-ct. Federal levy in some sections, to as much as 12 ct. in parts of Alabama.

The Diversion of Gas Taxes Begins.—As receipts mounted, legislators cast an eagle eye at this source of revenue and the diversion evil had its beginning. It assumed serious proportions in 1931. Before this date, Florida, Georgia and Texas diverted funds to schools. In 1930, Louisiana began in a modest way to divert gas tax money and in 1931, that state divided nearly \$2,000,000 between the Dock Board and the public schools. In the same year, Oklahoma diverted approximately \$1,000,000 for relief purposes. Several other states diverted comparatively smaller sums for such purposes as geodetic surveys, aviation funds, and other purposes.

Then came that well-remembered 1932. Relief for unemployment was a paramount issue and the gasoline tax seemed to be a fruitful source of revenue. Attempts were made to secure millions for this purpose in Pennsylvania and California. It is a tribute to the forces engaged in battling for the rights of motorists that these proposals failed.

However, New Jersey and New York joined the states diverting gasoline taxes, and Ohio permitted the counties to use their share of the state tax for relief purposes. The diversion to the state general emergency fund in New York will amount to approximately \$10,000,000 a year. In New Jersey, a \$5,000,000 bond issue to mature in 1941, is now being advertised, and it is estimated that it will require an outlay of \$625,000 annually from the gas tax funds to finance these bonds.

There is a source of diversion to which very little attention has been given, but which may prove to be an extremely fertile one. As you know, the states have been borrowing money from the Reconstruction Finance Corporation for unemployment relief. Only the other

day the State of Utah requested a loan of \$750,000. Under the terms of the act creating the R. F. C., the United States Government may withhold Federal-aid allotments unless the loans are repaid according to the specified requirements.

Now, it may surprise you to know that in Utah and in other places I have recently visited, the general impression prevails that these loans will not be repaid out of general state funds, but that the states will be willing to forego their share of Federal-aid when the loans come due. In other words, future Federal-aid monies on a large scale are being diverted to unemployment relief. This was made possible by the act creating the Reconstruction Finance Corporation, but you will readily see the confusion it is piling up for the future.

Thus, when final figures for 1932 are compiled, they will show that approximately \$40,000,000 was diverted by the states to other than highway purposes.

Mention should also be made, however, of the unofficial diversions taking place in many states. The gasoline tax offers a safe resource from which to borrow for miscellaneous purposes and such loans are often carried until the intention to repay them is forgotten. This type of diversion is difficult to trace for definite amounts, but offers added proof of the manner in which faith with the motorist is being broken.

As the bulk of the diversions are from the gasoline tax revenues, I shall not deal here with the limited amounts being taken from other motor vehicle revenues.

The Federal Taxes of 1932.—Now for the most disastrous tax blow of 1932. I refer to the Federal Revenue Act imposing five different levies on owners of motor vehicles. It was estimated that these Federal taxes would bring in \$258,000,000. They will fall short of that estimate by around 40 per cent. But there was established a dangerous precedent for diversion of motor taxes to general purposes and one that is certain to have a far-reaching effect on the actions of the state legislatures now in session.

On the basis of what has already happened, no one familiar with the situation can help but be concerned over conditions in the field of motor tax diversions. Those interested in the future of motor transport will do well to weigh carefully the responsibilities ahead.

When we speak of diversions to other than road purposes, we usually mean such purposes as:

First, unemployment relief.

Second, education facilities, public schools and in some instances universities and state colleges.

Third, to general administrative funds so that land taxes may be reduced.

Fourth, general civic improvements extending even to the care of the halt and the blind.

If motor vehicle revenues are to be applied in these fields where enormous expenditures are the order of the day, is it not apparent that the entire \$1,088,000,000 of motor taxes would constitute a mere morsel for the capacious maw? Here is a staggering outlook, so staggering indeed that we can well afford to forget the petty-ante stuff such as the propagation of oyster beds and fish hatcheries.

Now let us keep in mind that all those major purposes that I have mentioned above and for which road funds are being diverted are purposes to which every motor vehicle owner contributes his fair share as a taxpaying citizen.

The United States Treasury Department has recommended to Congress that the Federal gasoline tax of 1 ct. a gallon embodied in the 1932 Revenue Act be con-

tinued for another year, following the date of its expiration on June 20, 1933.

Definite proposals have already been advanced in state legislatures for raids of unprecedented proportions on motor vehicle revenues. These diversions would open the flood gates and seriously cripple road budgets for many years to come.

Secretary Wilbur's Suggestion.—Only the other day Secretary of the Interior Wilbur, in an address before the Citizens Conference on the Crisis in Education, urged that educators boldly challenge the highways and suggested that a billion dollars could be taken from roads and put into education. "Fight the highways," my good friend Secretary Wilbur said at another point in his address. He proposed diversions from gasoline taxes which he called "painless."

Yet, only a few weeks ago, the Federal Oil Conservation Board, of which Mr. Wilbur is Chairman, in a report to President Hoover, referred to the Federal 1-ct. gasoline tax as "an additional burden on a highly taxed commodity." With reference to diversions, the report said:

"Such uses of funds derived from gasoline taxes are at a variance with the purpose of the tax at its inception. Therefore, the fourth essential of a successful uniform gasoline tax law is that no part of the revenue derived from the tax should be diverted to uses other than for the benefit of automotive motor vehicles."

Fortunately, it is unnecessary for me to answer Secretary Wilbur. The Saturday Evening Post did it indirectly in an editorial published only a few days after he made his appeal. Let me quote from that editorial:

"Thanks to the zeal of some of our supereducators, we have added wings and L's, towers, turrets, loggias, and pergolas to the Little Red Schoolhouse of other years until the once-hallowed shrine resembles the fairy palace of Aladdin."

Let me hasten to add that I am in full sympathy with the movement to provide maximum educational facilities for the youth of the country, but as the Post editorial said:

"We have not only bought and paid for more education than our children can possibly absorb, but we are paying heavy bills that do not properly come under the head of schooling at all. Many millions go to pay for activities which, though no doubt beneficial, are the business of parents or of private benevolence and not that of public schools. Taxation puffing and panting to keep up with expenditure, has already run too fast and too far."

We must not forget that as a result of the consolidated rural school and the spread of our population, highways are today absolutely essential to education.

I spoke of the demands of educators for a share of road revenues. There is another group equally as insistent for aid. I refer to the over-enthusiastic land owners, who in the boom days demanded roads that were not justified by the volume of traffic. Now that land values have dropped, they are seeking relief from taxes at the expense of the car owner.

Our A. A. A. clubs and state associations are cognizant of the battle confronting them if they are to prevent the frittering away of motor vehicle taxes on a variety of civic projects which are properly chargeable to the entire taxpaying body and not to a single class of taxpayers.

Objections to Diversion Summarized.—In a bulletin addressed recently to our affiliations, the objections to diversion of motor vehicle revenues were summarized at some length. I cannot do better than cite the objections as set forth in this bulletin:

"Diversion would be tantamount to a scrapping of the principle that special motor vehicle taxes are justified only insofar as these taxes are used for a purpose in which the motor vehicle owners have a special interest, that is, roads. The gasoline tax, for instances, is recognized by all economists as a 'privilege' or 'use' tax. But the justification for it disappears the moment that the returns from the tax are applied to any purpose that is not directly connected with that privilege or that use.

"Diversion would be a direct step toward making motor taxes into general levies and making car ownership, rather than property ownership, income or 'ability to pay,' the principle of taxation.

"It would mean that one class of the population, namely, the owners of motor vehicles, would be subjected to discriminatory, double taxation. The motorists are already paying their share of general government cost through general taxes in their capacity as citizens. To use their motor taxes for these general purposes would simply mean that they are taxed twice for the same purpose.

"It would deplete state road budgets at a time when road revenues are shrinking as a result of the decline in motor vehicles and the decline in motor vehicle operation.

"It would greatly weaken the financial position of the state highway departments at a time when many local road building units are failing to meet their obligations and when the state highway departments are compelled to assume more of the obligation for the construction and maintenance of secondary roads.

"Every road dollar diverted from road use would militate against efforts to relieve unemployment. During the period of the depression, road building has been universally recognized as the most advantageous way in which money could be used from the standpoint of providing work for unskilled labor. Out of every road dollar, more than 80 per cent goes for labor.

"Diversion would jeopardize the one billion dollars of road bonds that are now outstanding and the greater part of which is predicated on future revenue from motor vehicle taxes.

"It would make it more difficult for the states to pay back to the Federal Government the emergency road loans of 1931 and 1932 and for which the Federal Government holds future Federal Aid allotments to the states as security.

"Diversion endangers the entire structure of motor vehicle taxation on which the future of highway transport in the United States depends."

Acknowledgment.—The foregoing is an abstract of an address presented Jan. 19 before the Highway and Building Congress, Detroit, Mich.

Resolutions Adopted by Highway and Building Conference

Resolutions adopted by the Highway and Building Congress—in which the American Road Builders' Association was one of twenty-one national organizations participating at Detroit during the week of January 16th—urge public works for employment, liberalization of the relief act, charging of improvements to capital account, continuation of federal aid for highways, elimination of gas tax diversion, low cost housing, and a federal department of public works.

This program which sets forth an aggressive course for re-employment and business recovery is expressed in 23 resolution planks some of which follow:

"Recognizing the gravity of the existing business, emergency and desiring to assist in relieving it, we the Construction Industry of the United States as repre-

sented by twenty-one national organizations meeting in joint session in Detroit, January 16-21, 1933, hereby adopt this platform of policies and measures for employment and business recovery:

"Construction is among the nation's largest industries and revival of its activities will determine in large measure the revival of general business. We confidently believe that general conditions are now favorable to a resumption of business in its normal channels if prompt and effective action is taken.

"1. We are unalterably opposed to the dole system and strongly advocate in lieu thereof first, an immediate constructive program of sound and needed public and semi-public improvements; and second, the adoption of such measures as will hasten the resumption of private construction in industry. Among the public and semi-public projects are highways, waterways, and other forms of transportation; flood control, water works, sewerage and refuse disposal, public buildings, and other similar projects.

"2. We demand maximum economy in the current administrative and operating expenses of government as well as an increased program of public works financed out of capital account. To further this end we urge that wherever possible the investment of the national government, states, cities, and other governmental subdivisions in permanent improvements be charged into capital account, as is the practice of private industry, and that only the carrying charges and amortization be included in current operating budgets.

"3. In view of the ineffectiveness of the construction loan operations that have been carried on under the Emergency and Construction Act, we advocate liberalization of self liquidating requirements and reduction of interest rates by suitable amendments of that Act.

"4. We appeal to states and municipalities to enact immediate legislation that will place upon a self-sustaining and self-liquidating basis through service charges such public services as sewerage and sewage disposal.

"5. We urge that all public agencies engaged in distributing relief funds adopt the policy of applying those funds wherever possible through planned useful work instead of through welfare doles.

"6. We urge the extension of the date of completion of current emergency federal highway work from July 1 to October 1, 1933.

"7. We deplore the proposal that federal aid to state highway improvement be curtailed or suspended at this time, and we urge Congress to continue the federal aid policy by appropriating during the present emergency a sum equal to that appropriated last year, and in any event not less than the revenues from federal taxes on gasoline and tires.

"8. We demand that the revenues raised from motor and vehicle fuel taxes and license fees be used exclusively for highway construction and maintenance, and we oppose the diversion of these fees and taxes to other purposes.

"9. We advocate the extension of federal aid to those organizations of state and federal aid highway systems within city limits, and we recommend such allocation as will give a fair proportion of the highway funds to municipalities for streets and roads within their corporate limits.

"10. We endorse the proper and reasonable regulation of highway transportation, such regulation to be premised on sound economics and not on a desire to establish parity of cost with other forms of transportation.

"11. We urge that all necessary measures be undertaken to promote the construction of adequate low rental housing and that the various states enact legislation to grant the power of eminent domain for this purpose.

"12. Believing that the heavy interest charges of fixed obligations are a serious obstacle to early credit restoration, we urge as an essential of economic recovery that interest rates on such fixed obligations be reduced and adjusted to conform to the general price level.

"13. We recommend that the federal government and the several states amend their bankruptcy and related statutes to simplify the process of reorganizing public and private financial structures by providing that approval of a substantial majority of bond or other certificate holders shall be sufficient to authorize such reorganization.

"14. We urge that state laws and municipal charters be amended to permit deferring payment for at least two years of the initial installments of special installments without penalty and at moderate interest.

RAILROAD CONTRIBUTION TO STATE HIGHWAY MILEAGE INSIGNIFICANT

By VICTOR J. BROWN

Associate Editor, Roads and Streets

Of the many misleading statements that appeared in the December 3, 1932, issue of *Railway Age* relative to highway transportation as a competitor of railroad transport, one of them follows:

"A part of this [tax] money was spent for road building, long before the motor vehicle was used; and these very roads are now being used as the foundation for our present cement or hard-surfaced roads. In other words, part of the tax paid by the railroads has been used against them through the use of the highways by competitive motor operators."—*Railway Age*, Dec. 3, 1932, pg. 796.

LET US ANALYZE THIS STATEMENT

It is naturally admitted that state highways are the principal routes over which highway transport agencies operate. Hence our problem is that of determining what percentage of railroad tax payments are spent on state highway construction and maintenance. Maintenance in the past has averaged about 30% of expenditures, leaving 70% for construction. However, we shall consider that all railroad taxes spent for state highways are spent for construction. Furthermore, we shall deal only with property taxes, as the railroads do not pay gasoline or motor vehicle taxes of significance to consider.

Total of all taxes collected—federal, state and local—less motor vehicle and gasoline taxes.....\$8,493,000,000

Total taxes paid by Class I railroads (approximately 96% of taxes paid by all railroads)..... 303,528,099

Therefore, all the railroads in the country pay approximately 3.6% of all taxes other than motor vehicle fees and gasoline taxes.

Of all taxes paid by railroads, 97% is paid to state and local authorities. Hence state and local authorities receive .97 of 3.6%, or approximately 3.5% of total taxes paid.

From the following calculations we may obtain ratio of state to state and local taxes:

Federal taxes collected, 1931 (approximate).....\$2,428,000,000

State property taxes and taxes other than on gasoline and motor vehicles 1,086,265,000

Total\$3,514,265,000

Total tax bill, as given above.....\$8,493,000,000

Total federal and state, as given above..... 3,514,265,000

Approximate local tax bill..... 4,978,735,000

State taxes (approximate).....\$1,086,265,000

Local taxes (approximate)..... 4,978,735,000

Total\$6,065,000,000

Therefore ratio of state to state and local taxes is approximately.... 18%

Hence railroads pay 18% of 3.5% of total collections minus motor vehicle levies as taxes to state authorities or..... 0.63%

State highway expenditures raised by general taxes according to the National Industrial Traffic League report to the Coolidge Transportation Committee (1931), approximately..... 1.41%

Hence 1.41% of 0.63% is railroad contribution to total general tax money spent on state highways of the entire nation, or approximately009%

In dollars and cents this contribution by all the railroads in all the states as taxes for state highway construction and maintenance would be approximately..... \$764,370

If all of this amount was spent for construction it would build about .64 mile of road in each state in the union of a high type sufficient to carry a loaded truck, while their average investment in each state is \$540,000,000.

Referring now to the quotation from *Railway Age* of December 3, 1932, page 796, as quoted above, we fail to see cause for excitement. Most any American taxpayer could show far greater cause than the railroads have for complaint that their own tax payments are "being used against them."

How to Place ROAD SIGNS for NIGHT DRIVING

By PROF. C. C. WILEY
University of Illinois, Urbana, Illinois

ALTHOUGH there has been great improvement in the marking of our highways during the past few years it requires only a small amount of night driving, even on the best marked roads, to show that much remains to be done to make our road signs fully effective at night.

The problem is primarily one of illumination. In the daytime the entire landscape is illuminated by strong diffused light quite uniform in brilliance to which the eye readily adjusts itself. During the major part of the day the direct rays of the sun strike the road signs at such angles that little trouble is experienced in getting good illumination. It is only when the sun is low or when there are sudden changes from brilliant sunlight to deep shade that lighting troubles occur in the daytime.

At night the landscape is dimly lighted by nature while the roadway and road signs are comparatively brightly lighted by the headlights of the vehicle. The eye therefore has some trouble in accommodating itself to these extremes of intensity. In addition the field of illumination from the headlights is not of uniform intensity and consequently there is a variation in the illumination of the sign as the driver approaches it. Furthermore, the headlights are so placed that direct rays from them can be reflected back directly into the driver's eyes causing "glare."

The so-called reflecting signs have been developed to overcome some of the troubles of night visibility by taking advantage of this direct reflection, thus turning a fault into a virtue. When well designed and properly installed such signs are quite efficient and can be used to advantage in special places. On the other hand, such signs are expensive to install and maintain, and, in general, are not so legible by daylight as the ordinary sign, hence their use is not universally economical. The problem, therefore, is to determine how to place the ordinary

sign so as to give it maximum visibility with freedom from glare.

For some time the writer has devoted considerable attention to this problem and has made numerous observations on existing signs to determine why some are satisfactory and most are not. These studies culminated in a series of experiments carried out as a thesis project under the direction of the writer by Mr. A. E. Haberle, a senior in highway engineering at the University of Illinois.

Conditions of Tests.—The tests were made during April and May, 1932, on Illinois State Highway No. 10 just west of Champaign. The signs used were loaned for the purpose by the Illinois Division of Highways through the courtesy of Mr. C. H. Apple, District Engineer at Paris. The automobile used was a 1931 Studebaker with headlights equipped with 21 c.p. bulbs and adjusted to factory standards which conform to most state requirements. Photographs were, for the most part, taken with an Eastman 1A Series III Kodak using Verichrome films. Day exposures were suited to the light. Night pictures were taken under full headlight with an exposure of 2 minutes with stop f-5.6. This exposure was more than necessary for the black and white signs and somewhat insufficient for the yellow signs.

After some preliminary work the final experiments were conducted on two signs as being typical of those normally used. The first was an Illinois standard mileage or distance sign normally placed at outgoing city limits. It was of wood painted white with black letters 4 inches high and measured 26 by 42 inches. The other was a standard American Association of State Highway Officials diamond shaped curve sign. It measured 34 inches on the diagonals and was of enameled metal with black lettering on a lemon yellow field. Both signs were new.



Fig. 1.—Distance Sign. Height to Center 3 ft. Distance 150 ft. Angle 85 degs. Full Glare Making Sign Appear Blank



Fig. 2.—Curve Sign. Height to Center 3 ft. Distance 150 ft. Angle 85 degs. Full Glare Making Sign Appear Blank



Fig. 3.—Distance Sign. Height to Center 4 ft. Distance 150 ft. Angle 60 degs. No Glare, Sign Distinctly Visible

The road had a shoulder width of 30 feet with an 18 foot concrete pavement down the center. A post was set 7.5 feet from the edge of the slab or 12 feet from the center line of traffic lane. Provisions were made so that the signs could be quickly suspended at any desired height, and braced to any desired angle with the roadway, and also be slightly tilted.

Legibility Limits.—The first step was to determine the normal legibility limits of the two signs. The maximum legibility distance was taken as the distance at which the indications of the sign became distinctly visible to an observer with normal vision. This was done by averaging the results of several trials by three independent observers and was found to be 150 feet for the mileage sign and 350 feet for the curve sign. The minimum distance was that at which the sign passed from the effective field of vision. With the signs set normal to the road this was found to be about 15 feet for both day and night but decreased as the sign was turned toward the road.

These values mean that for the mileage sign there is, at best, a distance of not more than 140 feet in which the sign must be read. At a speed of 45 miles per hour the driver has only 2.1 seconds to get his information. It is difficult to read the signs in this length of time even in daylight and, unless the signs are properly illuminated and free from glare over this entire distance they can not be read at all at night. The curve sign has a reading time of about 5 seconds which is normally ample if the illumination is good.

Proper Height.—The second series of tests was for the purpose of determining the proper height of signs above the crown of roadway. For daylight conditions this was done by making several runs at speeds of 45



Fig. 5.—Distance Sign. Height to Center 3 ft. Distance 40 ft. Angle 85 degs. No Glare. Sign is in Secondary Field of Illumination and Relative Heights Prevent Direct Reflection from Headlight to Eye. Letters Slightly Distorted Due to Angle of Vision



Fig. 4.—Curve Sign. Height to Center 3 ft. Distance 150 ft. Angle 60 degs. No Glare Sign Distinctly Visible. (Photo overexposed)

to 50 miles per hour past the signs set at several different heights and recording the opinions of the three observers. The consensus of opinion was that the top of any sign should not be more than 4 feet above the roadway or for ordinary road signs as used in the test the height to the middle of the sign should be about 3 feet. The reasons for this are that if the sign is placed higher the eyes must be raised from the normal driving position as well as turned laterally in order to see the sign clearly thus calling for unnecessary effort and unnecessarily distracting the driver's attention from the roadway. A low sign causes the same trouble by requiring the sight to be lowered. The normal driver watches the road 400 to 600 feet ahead of the car. With his eyes at 5 feet above the road similar triangles will show that a height of 3 feet to the center of the sign requires a minimum of shifting the sight other than laterally within the normal visibility range.

The height desirable for night driving was determined by observing the signs in the same way at night and also in checking the illumination from the headlight. It was found that, so far as the illumination is concerned, the signs should be about a foot lower than indicated above. On the other hand it was found that the illumination was normally sufficient at a height of three feet if the signs were set to eliminate glare. The white sign was much better than the yellow sign in this respect but since the reading time was more than twice as long for this sign there was no difficulty in getting its indication. The conditions with respect to the line of sight were the same as by day and therefore the consensus of opinion was that a height of 3 feet to the center was the



Fig. 6.—Curve Sign. Conditions and Behavior Same as in Fig. 5. Primary and Secondary Fields of Illumination Well Shown

(This shows that the yellow sign does not photograph well. It is under-exposed while the white sign is over-exposed.)

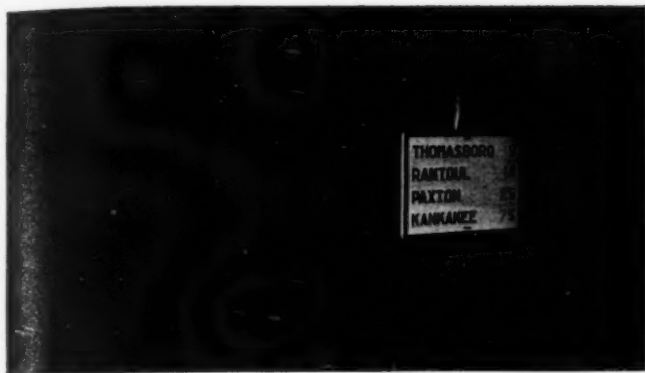


Fig. 7.—Distance Sign. Height to Center 3 ft. Distance 10 ft. Angle 85 degs. No Glare But Sign Distorted Due to Small Angle of Vision

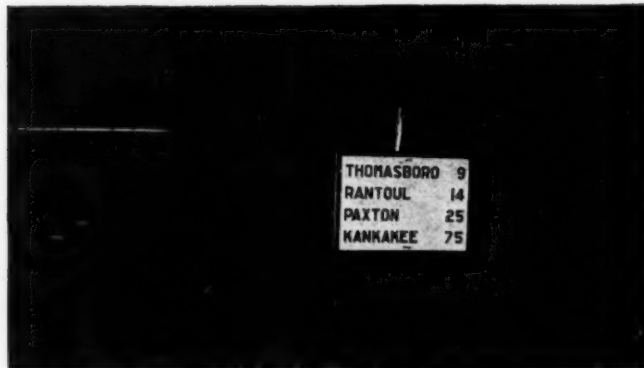


Fig. 8.—Distance Sign. Height to Center 3 ft. Distance 10 ft. Angle 60 degs. No Glare and Sign Not Distorted by Perspective as in Fig. 7

best, all factors of convenience, illumination, and freedom from obstruction by grass and weeds considered.

Elimination of Glare.—The next series of experiments dealt with the elimination of glare and the securing of adequate illumination at night. It was found that these results could easily be accomplished by the simple expedient of changing the angle of the sign with respect to the road, aided by a slight tilting. The results can be best approached by referring to the photographs.

Figs. 1 and 2 show the two signs from a distance of 150 feet (legibility limit of the mileage sign) when set at a height of 3 feet to the center and turned at an angle of about 85 to 87 degs. with the centerline of the road. In both cases there is a decided glare and the signs appear totally blank. This was true to both the eye and to the camera. Enlargement of the picture, either by direct observation with a lens or by projection, shows no traces of lettering. The same conditions held with other heights and the same angle.

With the sign set 12 feet from the centerline of the traffic lane and 150 feet along the road from the driver, the angle required to face the sign directly towards the driver is about $85\frac{1}{2}$ degs. The spread of the reflection from a 42 inch sign is about 3 degs. This means that if the sign is set at any angle between $82\frac{1}{2}$ degs. and $88\frac{1}{2}$ degs. there is certain to be a glare starting just at the place where the driver should begin to be able to read the sign. By the time he gets out of this area of glare and recovers from its blinding effect he has lost so much of the legibility distance that he is often unable to get the desired information at all. A little calculation of angles and distances will show that angles between 80 and 85 degs. could hardly be improved upon to make the signs unreadable at night.

The American Association of State Highway Officials

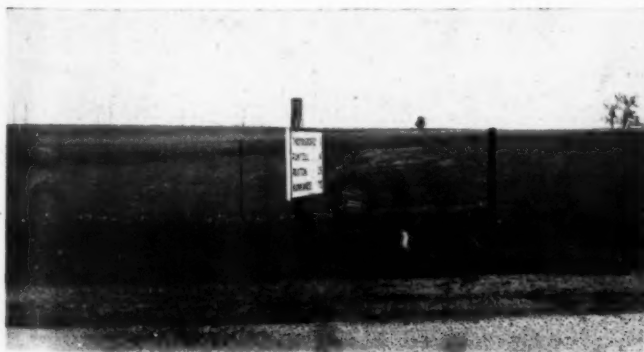


Fig. 9.—Distance Sign. Height to Center 3 ft. Distance Zero. Angle 60 degs. Daylight. Sign Legible Although Directly Opposite



Fig. 10.—Curve Sign. Height to Center 4 ft. Distance 180 ft. Angle 85 degs. Glare Makes Colors Appear Reversed. Gives a "Flash" When Passing at Normal Speeds

I'm Telling You!



a height of 3 feet and also by Fig. 7 taken at a distance of 10 feet all measured along the roadway. This glare, however, has been observed as a kind of "flash" from signs set 4 feet or more above the road. Here the relative heights of eye, sign, and lights are just about right for a reflection to reach the eye at a distance of 20 or 25 feet.

This is still another advantage of the 60 deg. angle at the shorter distances as shown in Figs. 5, 6, 7, and 8, namely, better legibility due to a better angle of presentation. In fact Fig. 9 shows that the sign is easily read by daylight when directly opposite—if an observer can devote his attention to it.

Fig. 9 shows an interesting phenomenon observed with metal signs. The letters and arrow appear white on a darker background whereas they are actually black on yellow. This occurs in the 150 to 200 ft. glare belt on signs set at about 85 degs. To the eye it appears as a sort of "flash" somewhat blinding. By driving slowly the point of maximum brilliance was found and the photograph made. It appears to be due to the shape of the raised letters aided possibly by a difference in the reflecting powers of the two enamels. It is practically eliminated by the 60 deg. angle and 3 deg. tilt although some slight reflection may still be obtained from the edges of the raised letters.

Some observations were also made on route markers. Markers placed outside the shoulder line are practically worthless at night. They do not receive enough illumination and the horizontal and vertical shifting of the line of sight delays the reading until too late. Markers should be treated as signs and placed in similar locations and turned at the same angles. They show well when

set below standard signs on the same posts. Headwalls and endposts can often be used to advantage.

Conclusions.—The conclusions may be briefly summarized as follows:

1. For signs having vertical dimensions of 24 to 36 inches the height above the crown of roadway to the middle of the sign should be about 3 feet.
2. For two lane roads with the sign 15 to 20 feet from the centerline the sign should be turned toward the road at an angle of not more than 60 degs. with the centerline. For wider roads the angle should probably be decreased to about 50 degs.
3. Added safety from glare can be obtained by tilting the sign forward about 3 degs.
4. Route markers should be placed along the shoulder line. They may be placed below other signs on the same post and should be turned to the same angle as other signs.

PERSONS EMPLOYED ON STATE HIGHWAY SYSTEMS, IN FEDERAL FORESTS AND PARKS, DURING AUGUST, 1932, AND RATIO OF EMPLOYMENT TO POPULATION

| State | By State | By Contractors | On National Forests and Parks | Total | Population per Person Employed |
|---------------------|----------|----------------|-------------------------------|---------|--------------------------------|
| Alabama | 1,928 | 1,118 | .... | 3,046 | 869 |
| Arizona | 652 | 634 | 447 | 1,733 | 251 |
| Arkansas | 776 | ..... | 9 | 785 | 2,362 |
| California | 3,510 | 3,107 | 756 | 7,373 | 770 |
| Colorado | 1,277 | 1,267 | 414 | 2,958 | 350 |
| Connecticut | 2,278 | 305 | .... | 2,583 | 622 |
| Delaware | 147 | 399 | .... | 646 | 369 |
| Florida | 1,991 | 3,036 | .... | 5,027 | 292 |
| Georgia | 3,152 | 4,148 | .... | 7,300 | 398 |
| Idaho | 959 | 1,177 | 164 | 2,300 | 193 |
| Illinois | 8,090 | 7,681 | .... | 15,771 | 484 |
| Indiana | 7,190 | 5,245 | .... | 12,435 | 260 |
| Iowa | 1,732 | 4,147 | .... | 5,879 | 420 |
| Kansas | 1,803 | 2,454 | .... | 4,257 | 442 |
| Kentucky | 5,340 | 4,368 | .... | 9,708 | 269 |
| Louisiana | 2,427 | 1,875 | .... | 4,302 | 489 |
| Maine | 11,480 | 2,002 | 15 | 13,497 | 59 |
| Maryland | 3,306 | 3,343 | .... | 6,649 | 245 |
| Massachusetts | 1,947 | 2,849 | .... | 4,796 | 886 |
| Michigan | 6,243 | 4,172 | .... | 10,415 | 465 |
| Minnesota | 4,357 | 7,674 | 158 | 12,189 | 210 |
| Mississippi | 1,494 | 537 | .... | 2,031 | 990 |
| Missouri | 7,467 | 9,055 | .... | 16,522 | 220 |
| Montana | 1,061 | 583 | 710 | 2,354 | 228 |
| Nebraska | 1,513 | 2,161 | .... | 3,674 | 375 |
| Nevada | 256 | 523 | 34 | 813 | 112 |
| New Hampshire | 1,175 | 1,885 | .... | 3,060 | 152 |
| New Jersey | 1,121 | 2,325 | .... | 3,446 | 1,173 |
| New Mexico | 939 | 910 | 113 | 1,962 | 216 |
| New York | 5,911 | 10,398 | .... | 16,309 | 772 |
| N. Carolina | 9,263 | 288 | .... | 9,551 | 332 |
| N. Dakota | 886 | 2,371 | .... | 3,257 | 209 |
| Ohio | 10,045 | 8,769 | .... | 18,814 | 353 |
| Oklahoma | 2,479 | 3,787 | .... | 6,266 | 382 |
| Oregon | 834 | 1,949 | 442 | 3,225 | 296 |
| Pennsylvania | 30,596 | 6,708 | .... | 37,304 | 258 |
| Rhode Island | 785 | 254 | .... | 1,039 | 662 |
| S. Carolina | 1,457 | 1,404 | .... | 2,861 | 608 |
| S. Dakota | 728 | 1,379 | 78 | 2,185 | 317 |
| Tennessee | 1,829 | 1,774 | .... | 3,603 | 726 |
| Texas | 12,651 | 8,230 | .... | 20,881 | 279 |
| Utah | 2,611 | 1,365 | 90 | 4,066 | 125 |
| Vermont | 1,092 | 922 | .... | 2,014 | 179 |
| Virginia | 3,973 | 3,458 | 283 | 7,714 | 314 |
| Washington | 2,614 | 2,177 | 431 | 5,222 | 299 |
| West Virginia | 3,654 | 2,109 | .... | 5,763 | 300 |
| Wisconsin | 4,780 | 8,469 | 54 | 13,303 | 221 |
| Wyoming | 726 | 983 | 403 | 2,112 | 107 |
| Total | 182,525 | 145,874 | 4,601 | 333,000 | 367 |

It should be borne in mind that the above tabulation does not include the men engaged on road work for counties, townships, towns or cities.

ADMINISTRATIVE RELATIONSHIP *of State and County*

By VICTOR J. BROWN

Associate Editor, Roads and Streets

ADMINISTRATIVE and Financial Relationship of State and County in county and local highway work is closely interwoven with the administrative relationship in general activities. The following discussion does not pertain, necessarily to any one state but varies in its details among the 48 states. Even among the counties in a state in some instances there is considerable variance. This discussion considers principally the administrative relationship of state and county in respect to highway affairs and suggests an administrative organization for county highway work which seems logical to promote efficiency and increase the standard of highway construction and maintenance.

Function of County.—Counties are now referred to as bodies corporate and political with powers to contract county obligations. In some states they are included in the class of municipal corporations; but in most states they are considered only as quasi-corporations. By and large, however, they are not municipal corporations, but civil and political subdivisions of the state, and certain quasi-legislative powers may be given them. In other words, the county possesses political and business functions. While in most states judicial opinions distinguish counties from municipal corporations, there are a number of states where counties are recognized as municipal corporations by constitutional or statutory provisions, or in judicial opinions.

In general, the county, however strongly entrenched it may be in popular tradition, is merely a territorial subdivision of the state created for administrative convenience.

The number of counties, the location of their boundaries, much of their internal organization, and many of the governmental or administrative functions which they exercise, represent an inheritance from the past, when conditions were radically different. That the county, as it now exists is in some respects and instances poorly adapted to modern conditions and contemporary needs, is generally recognized; but so strong is the force of tradition in many quarters, the county is still taken for granted as a more or less unchangeable unit of self government, enjoying a relationship to the state which is assumed to differ little from that of the state or nation. If the thinking habits of the people in this respect were readjusted in regard to most of the administrative functions of self-government, reorganization on an efficient and economical basis could be more easily and more quickly accomplished.

The county is merely a creature of the state; it derives its existence and its powers from the law, constitutional or statutory. There are, however, certain functions that should reside in the counties (as it now exists or as it may be changed) because of certain disadvantages connected with absolute centralization of those functions within the state. Administration of county and local highways is a good example. Centralization of authority

over expenditures for all roads in the state, offers a means by which petty political and personal interests may be served. Organization might become the football of factionalism. The prime motive in changes that would be made through a change in the executive head of the organization might be to put one individual out of office and another in, or to remove political patronage from one official and department head and give it to another. It goes without saying that this is not the method by which administrative organization may be consistently improved. Cooperative endeavor and a relationship of consultant and client between state and county, so far as highway work is concerned would seem to be the logical solution for fostering progressive tendencies.

No complete solution of this problem will be possible until definite coordinated highway policies are established for the state and county. The 1931 report of the A. R. B. A. Committee on Administrative and Financial Relationships of State and County enumerated many points that should guide this relationship until definite fundamental, coordinated highway policies are adopted.

Classification of Counties.—All parts of a state are not as a general rule, on a parity with respect to wealth. It is necessary, therefore that legislatures should adopt, or there should be embodied in the Constitutions, sound classifications of counties. This classification may be based upon population, upon mileage of roads in the counties, upon property valuation, or upon some other criterion. The essential thing in this is that all legislation relating to county administration should refer back to some pre-established and reasonable classification of counties. This will then afford a yardstick by which to measure proposed legislation. When a legislature is in the habit, as is the federal Congress with respect to federal road aid for the state, of observing such a classification and legislates for classes of counties rather than for single counties, marked improvement in legislation occurs, chiefly for two reasons:

1. Because any member who prepares a bill of limited territorial application must consider administrative needs and administrative principles, in general, rather than a purely local and possibly transitory situation in a single county; and

2. Because, when a bill relates to a class of counties instead of one county, the number of members who are interested in it and willing to question its desirability becomes large enough to insure some measure of discussion and deliberation prior to its enactment.

County Roads a County Problem.—This discussion, while more applicable to general functions of county government, nevertheless pertains to county and local road administration. Old functions such as law enforcement, education, and welfare, have become matters of state wide concern because they pertain to individuals of the social order who now move freely over the state

without recognition of county lines, and for those who live and have their business relationships on more of a state wide basis. This, however, is not the case with the function of *highway construction and maintenance*, because the highways are in fixed locations and are designed to fit local conditions. To place county and local highway construction in the same category with law enforcement and education as county functions to be administered by central state authority would be trying to satisfy two separate theories with one explanation. On the one hand is the theory that county road problems are similar in the various counties. On the other hand is the knowledge that the problems in the various counties are particular, local, and dissimilar. A proper territorial unit for highway purposes is not necessarily equally adapted to efficient law enforcement, or to the administration of educational, health and welfare functions.

jectives of administration is to promote and encourage accuracy of expenditure recording, for only through this means will the administrator, the county engineer, be able to analyze the effectiveness of certain expenditures. His analysis will lead to a program for reducing expenditures. In other words, uniform accounting makes possible an examination of present activities, an appraisal of the value and dispensability of certain portions of those activities, and a study of the efficiency and the attendant cost of their performance.

A county accounting system which will provide the necessary information, and an effective budget system which will assure the balancing of expenditures by revenues should be mandatory by state law on all county governments. The system may be separate but is preferably part of a general county accounting system. Uniform accounting enables the county engineer to plan and build county roads and bridges at exactly the rate of

No complete solution of our highway problem will be obtained until definite basic highway policies are established

Centralized County Authority.—Were county road work to be centralized in the hands of the state, when things go wrong with road work it would practically be impossible for the voters to know who is to blame, and when results are satisfactory it would equally be difficult to know whom to reward. With a sound and simple administrative relationship between state and county with county road work administered by the county, the voters could fix responsibility definitely. Under conditions where responsibility can be easily shifted, incompetence and inefficiency normally characterize administration.

As a general principle, the county should have a single responsible body, elected by the people and vested with power to adopt a budget covering all expenditures in the county, to levy all taxes for county purposes, to determine all policies, and to appoint and remove all county administrative officials. With such a plan in operation, the county electorate would know precisely where to place responsibility and it could act accordingly when electing members of the governing board. The latter, when held solely responsible for county administration would tend to appoint to county offices the persons best qualified to fill them. Centralization of authority and responsibility in the elected county board, therefore enables the people to function effectively and at the same time increases the efficiency of administration.

Centralization of all administrative activities progressing within the county under the jurisdiction of the elected governing board is not desirable. The automobile, radio, telephone, telegraph, etc., has so changed our social conditions that human activities transcend county lines. Hence administration of government of the social order with respect to such functions as welfare, health, education, and law enforcement may well be placed under centralized state control. The interrelationships of men are such that people must more freely cover the state. Men are not confined to fixed locations to work or serve under fixed local conditions. However, highway construction and maintenance in the county is local in nature because the highway is fixed in location and serves a fixed purpose, locally.

Uniform Accounting.—One of the most important ob-

accomplishment the people of the county desire as expressed by their vote for the elected commissioners. Separate cost accounting systems should be kept by county engineers so that individual operations may be analyzed.

Highway Policies Needed.—At the 1931 convention of the American Road Builders' Association the Committee on Administrative and Financial Relationship of State and County under the chairmanship of Arthur W. Brandt, State Highway Commissioner of New York, presented a comprehensive report.

There are a few basic thoughts that were not included in that report. Principal among these fundamental questions is the establishment of national, state and local highway policies.

1. Why are we building highways?
2. For whose benefit are we building highways?

Administrative—

Having answered these questions we should then determine:

1. Should highways be required to be built on a solely economic basis?
2. Do not other important intangible values justify construction of certain roads? If so, what values and what roads?
3. Do these values have greater weight than purely economic values in these cases?
4. Should the lesser and local roads be built from taxes on land and why?
5. Should motor vehicle license fees, gasoline taxes, and other imposts levied on automobiles, trucks, buses, filling stations, garages, and tires be used entirely for highway construction, maintenance and administration?
6. What should be the basis of determining relative allotments of funds between states and counties?
7. What are the relative rights of the various types of vehicles to the use of the highway?
8. Is there a difference between commercial and private operation of vehicles over the highways so far as economics or principles of taxation are concerned? That is, is non-economic operation of privately owned and

operated motor vehicles justifiable or unjustifiable in the case of commercial motor vehicles?

9. Since heavy commercial vehicles require a thicker and stronger wearing surface than privately owned passenger vehicles, should they be required to pay for the extra cost of construction above what would be required for private passenger car operation?

10. Should county highway improvement be based upon the theory that county highways serve particular conditions inherent to the county or upon the theory that county highways are feeders to the primary state highway systems?

Justification for Highway Construction.—From the state administrative point of view it might be argued that because highway construction in the counties requires a high order of technical training and qualification, the state with its ability to collect larger funds, can better afford to provide the technical knowledge required for road construction than can the individual counties. On a purely economic basis, this is only partially true. But justification for county and local highway construction is based not only on the economics and traffic analyses involved but also upon the intangible values that accrue due to improving certain roads in a community.

Lack of Uniformity.—In some of our states road work in the counties is supervised in many different ways within the same state. County highway administration in these cases, has been dealt with quite largely by local laws, or by general laws having local application. This legislation, which in most cases has not been codified, displays little semblance of uniformity, consistency, permanence or regard for sound principles. The condition is readily and easily understandable when it is realized that neither states, counties nor the federal government have established definite highway policies founded on the basic principles mentioned before, viz.:

1. Why are we building highways?
2. For whose benefit are we building highways?

Aiding and abetting the general confusion is the political expedience of dividing counties into districts, beats, supervisory districts, precincts, etc.

These subdivisions indicate the prevalence and persistence of petty political manipulation. Such conditions are undesirable, expensive to the county property holders and a hindrance to efficient county highway administration.

Methods of Administration.—The degree of administrative control over county highway work varies widely.

County roads are a county problem because they are in fixed locations and are established and improved to satisfy fixed local conditions

These intangible values, such as the social, recreational, religious and educational values, while not measurable are nevertheless important factors in the justification for county and local road construction.

An important value to be considered in the analysis for justification of construction and one which tends to indicate that land should stand a certain portion of the construction cost is access value. This may be defined as the value created by reason of making a piece of property more accessible. Proximity of property to the improvement establishes a measure of this value. The value is created by a type of surface which suffices to permit year around ready safe access to the property under all weather conditions. Any excess cost of construction has no access value so far as that piece of property is concerned.

Highway Supervision.—Because of the danger of bureaucracy through concentration of authority over all roads in the hands of the state highway departments, and

Because of the easy opportunity to build up a powerful political machine based upon the administration of road funds if concentrated under the authority of state highway officials, and

Because county highway systems are fixed in counties and must be designed primarily to serve county conditions and only secondarily as feeders to state highway systems, and

Because it is reasonable that a democratic people control the administration of their county and local highway expenditures;

Jurisdiction over county and local roads should be placed with the county board, and the state highway department should be established in a consulting capacity with respect to county and local road work.

The principal methods of administrative supervision may be classified under the following captions: reports, inspections, advice, and state aid grants, as persuasive devices; and approval, review, orders, ordinances, removal and appointment as an ascending order of more effective methods. A basis for any system of supervision is the collection of information as to local and financial conditions. For this purpose the system of Uniform Accounting mentioned above, is indispensable. State grants of money to local authorities for highway purposes are not in themselves a method of supervision, but are, in most cases, a means of the state for securing supervision by state highway authorities over county and local highway work. Provisions for direct state control are often the culmination of such a system of supervision. Hence, the administrative relationship of the state highway department to the county highway departments should as stated before, be that of consultant to client, and be stipulated by legislative action.

Placing Responsibility.—Reorganization by the abolition of county subdivisions is recommended. With the passing of these dispersion factors, the way will be open to treat construction and maintenance of county and local highways as a technical and county wide function, demanding definite location of authority and responsibility. Furthermore the sound principle needs to be accepted that, while a board is appropriate for quasi-legislative and supervisory functions, a single head for the actual direction of work must be established to obtain the greatest degree of efficiency in its performance.

Since construction and maintenance of highways involve specialized engineering work, it follows that the directing head of the organization should be a competent highway engineer. In many counties throughout the country this fact is recognized and the highway engineer is already established. That it is not universally

the case, is due not only to conditions cited heretofore but also to the multiplicity of counties, which by reducing the size and resources of this territorial civil subdivision of the state tends on the one hand to minimize the importance of highway administration and on the other to make it appear that the county cannot afford to pay the salary of a qualified technical director. As stated before, considerations of political expediency have entered in, with the result that elected officials have been reluctant to transfer to a technical official a function which can be utilized for the dispensing of political favors. Highway administration in many counties has been constituted from the point of view of persons and politics rather than of principles. In this field of administration, a change of attitude on the part of the legislatures with regard to local legislation is a condition-precedent to the establishment and the permanent maintenance of a sound efficient organization.

County Commission.—Counties should have one quasi-legislative and supervisory body for the administration of county functions. It needs no special board or commission, as is too often the case, for highway administration. General supervision over highway expenditures should be assigned to the county commission. This elected commission, however, while the proper body to determine policies and to exercise general supervision, is *not fitted* to assume immediate charge of highway work. Neither are the members of the commission acting individually. A man technically qualified to direct highway work cannot be obtained except rarely and accidentally, by popular election.

Therefore, state laws should be changed in those states in which this practice is prevalent. Also, it is essential to repeal all statutory provisions charging the county governing body or any of its individual members with the immediate direction of highway work, the spending of highway funds, the purchase and custody of equipment, material and supplies, the appointment of supervisors, overseers, or foremen, the fixing of their compensation, and the employment of laborers.

The function of the county commission should be restricted by state law to the adoption of the budget, the determination of general policies, and the appointment and supervision of the county engineer. The latter should be technically qualified; he should be appointed for a term by contract and removable after fair hearing of charges for inefficiency or malfeasance by the county board or commission; his salary should be fixed by the county commission; he should report to that body. If cooperation of two or more counties is necessary to attain this standard provision should be made for counties to do so. The general form of organization should be mandatory on all counties.

State Aid.—Since the construction of state routes must be justified primarily upon an economic basis, it is desirable from the state's point of view to consider primary county road systems as feeders to the state highway systems. State aid granted to counties, upon this theory, should be used for construction of county primary systems. State aid granted upon the theory that traffic originates on the county road systems, both primary and secondary, and therefore funds should revert back to that source, should be left to the jurisdiction of the county commission for proper expenditure. Until highway policies are established, as suggested hereinbefore, this aid must be distributed upon some arbitrary basis.

As preliminary to the formulation of any such scheme it is necessary that comprehensive data and information be collected designed to indicate the exact status and requirements of county road development.

Such a survey should be designed to produce at least the following basic information:

1. Extent, character and condition of road mileage in each county.
2. Amount of investment in county and local road systems.
3. Outstanding debts which each county has contracted for road purposes classified as to which was contracted for benefit of existing state highway system construction and which for benefit of local condition improvement.
4. Sources and amounts of total annual income for each county.
5. Present value of road equipment and materials.
6. Transportation surveys.

At least this much information must be available before any progress can be made toward the formulation of a state aid plan. Re-allocation of revenues derived from special motor vehicle taxes will make possible a practicable plan of coordination of the road building efforts of state and county agencies.

The direction which highway development will take in the next few years will be determined very largely by legislative action on the problems involved in the proper allocation of revenues to highway purposes.

Recommendations.—The recommendations made hereafter are designed to emphasize principles which should guide legislation rather than to designate the action that should be taken with respect to specific conditions.

1. Definite coordinated fundamental highway policies should be established by the states and counties.
2. In order to enable legislatures to reorganize county administration or consolidate counties by general laws and adopt them to the administrative needs of the states, all provisions specifying or establishing particular county offices should be eliminated from state constitutions.
3. The legislatures in legislating for the counties, should refrain from providing in detail for matters that should be left to local determination.
4. There should be one general law for the whole of each state establishing the principal units of county organization, with options provided in certain cases to be adopted only with the approval of a majority of the qualified electors of the county.
5. There should be adopted by the legislatures, or embodied in the state constitutions, sound classifications of counties, and all legislation relating to county administration should refer back to this pre-established classification.
6. Consideration should be given to the possibility of eliminating unnecessary offices by consolidating adjacent counties.
7. County and local highway improvement should be based upon the theory that the county road is designed to fit special local conditions, primarily and only secondarily as feeders to state highway systems.
8. With respect to county functions, responsibility should be centralized in the governing boards of the counties.
9. It should be clearly stated in the state's laws that the county commissions are to possess and exercise general supervisory authority over county and local highway administration.
10. County uniform accounting systems and budgets should be mandatory by state law.
11. In considering justification for county and local road improvement other values than the purely economic may have greater weight.
12. State highway departments should be placed in a consulting capacity to county highway departments,

similar to the relationship between a consulting engineer and his client.

13. County commissions should be relieved of all duties in connection with the appointment, removal, or compensation of sub-ordinate employes in county highway activities.

14. Two or more counties should be permitted and encouraged to cooperate in the employment of a county engineer.

15. The county engineer should be left free to organize the road work of the county according to its needs, without regard to commissioners' district, precincts, beats or other subdivisions.

16. County and local highway construction funds should be established by state law and diversion therefrom prohibited by penalty.

17. Counties should be the recipients of state aid from the vehicle fees and gasoline tax revenues and should not be compelled to forfeit control over road work on which such expenditures are planned or proposed to be made.

18. State highway departments should complete systems of state highways as now planned before adding more mileage.

Acknowledgment.—The writer prepared this report for presentation at the recent convention of the American Road Builders' Association. He acknowledges indebtedness to publications of the Institute for Government Research of the Brookings Institute for many leading thoughts presented herein.

Carrying Road Tax Message to Garcia

IS the gas tax doomed to become a class tax? Not if the growing indignation of motorists, over the use of road-pledged funds for purposes far removed from road building, succeeds in bringing home to legislators the folly of diversion, past or contemplated.

One of the unique features of the "gas" tax, over and above its extreme collectability, is the fact that it is paid only by the highway user. The non-motoring public is not only free of this tax; it reaps a benefit for which it did not pay when and as it joins the motoring throng. Each year since 1919, when the gas tax made its debut in Oregon, a larger share of the expense of carrying on road construction and maintenance is being borne by what one embattled retailer dubbed "taxoline" and "tag-x," until today over 90 per cent of such improvements are so financed.

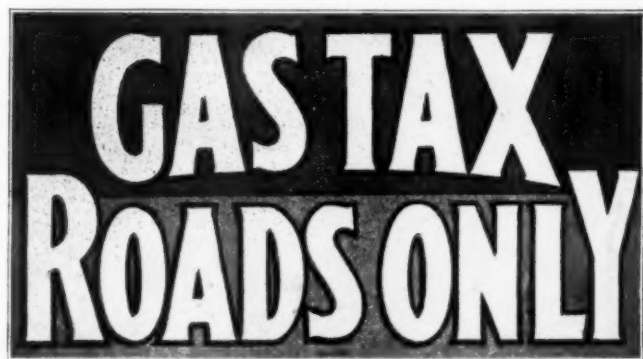
Now, with the diversion of the funds raised originally for road building reaching wholesale proportions, motorists are beginning to wake up to the fact that, in thus providing funds for all sorts of emergencies (in one state it went so far afield as the printing of election ballots), they are being picked on as no other class has ever been in free and equal America. They are entirely willing to pay for good roads, they say, because good roads provide new or improved facilities for going places and therefore spell operating economy. They go so far as to suggest that road building and improvement progress be pushed in the hope of providing work relief instead of charity for unemployed thousands. But when it comes to supplying funds for practically every purpose except the one for which gas and vehicle taxes were intended, they draw the line. That, says the swell-

ing chorus of protest, is the sort of unfair, class taxation that will kill the goose which laid the golden egg.

As an expression of this sentiment, red, white and blue stickers reading "Use GAS TAX for ROADS ONLY" are beginning to blossom on windshields and rear windows of cars in several states, motorists in Rhode Island, Connecticut, Tennessee, Massachusetts, Ohio, Indiana and Illinois leading the parade. The stickers, one of which is reproduced here in black and white, are 6½ in. wide by 3½ in. high and are not only striking but highly legible. They are being produced by the Ray Press, 633 Plymouth Court, Chicago.

As companion pieces to the stickers, the Ray Press is also producing 12-in. window cards which carry the same message in an arresting design; letter-head cuts answering the same purpose on a smaller scale; and two folders forcibly summarizing the potential damage of diversion to road building and maintenance programs, as well as its tendency to increase rather than decrease unemployment relief. These pamphlets are titled "Use MOTOR TAXES for ROADS ONLY" and "GET YOUR MONEY'S WORTH FROM YOUR ROAD TAXES."

The movement has the active support of numerous forward-looking organizations; for, after all, even though the funds so gained are utilized for the most praiseworthy and unselfish purposes, diversion seems to carry a taint of trickery which is not easily justified on ethical grounds. Car owners paid the prescribed taxes, and paid them willingly, in the belief that they were paying for the highways they have used in the past and were providing for the improvements they need at the present.



Red, White and Blue Symbol of the Motorists' Protest Against Diversion of Gas Taxes; Which, They Say, Means Class Taxation.

Moreover, if the burdens of all classes are to be put upon one class of citizens just because it is easiest, at the present time, to collect from them—what is to become of that generous class in the long run?

When to Drag

The dragging of these roads (gravel or crushed stone) is a very important factor. About every two to four weeks, depending on the traffic, a power grader or heavy multiple blade machine should go over the road, putting it in shape for light equipment. On traffic under 200 vehicles per day we find it sufficient to drag the road with light equipment every fourth day or once a week. On traffic of 200 to 700 vehicles per day the road requires dragging every other day, and when traffic exceeds that amount dragging should be done every day, especially if there is much wet weather.—Geo. E. Stephenson, Engineer of Bruce County, Ontario, in *Contract & Engineering Review*.

FORTY BILLION DOLLARS

INVESTED IN ROADS,

Streets and Motor Vehicles*

THE largest "public utility" in America is the highway system and its rolling stock. It represents an investment that is 50 per cent greater than the next largest "public utility," namely, the railways. The railway investment totals 27 billion dollars as compared with nearly 40 billions in highways, and highway vehicles. Of this huge sum about 17 billions are invested in roads and streets, and 23 billions in motor-vehicles, garages and filling stations. We include filling stations because they correspond with the fuel and water stations on railway lines. We exclude oil wells, etc., for they correspond with the coal mines which the railways do not own. In the following estimate the editors of *ROADS AND STREETS* aimed to secure a total highway industry investment comparable with that shown by the Interstate Commerce Commission as the total investment in railway plant. The latter includes large sums for right of way and terminal lands, but we have made no attempt to estimate the value of rights of way of highways. We have included an estimate of the cost of securing right of way easements.

This 40 billion dollar highway "plant" is perhaps the most remarkable development of modern times. During the 15 years ending in 1928 American motor-vehicles increased 19 fold in number. Road improvement lagged woefully behind this increase in rolling stock, for the mileage of "surfaced roads" only doubled during those 15 years. A "surfaced road" is one having a wheelway surfaced with gravel, macadam or some better type of hard surface.

A good many newspaper editors have spoken of so-called extravagance in road building without realizing that road building has lagged far behind the buying of automobiles. We have

yet to read a single editorial condemning the public for buying too many automobiles. It would be a singularly foolish public that would invest more than 18 billion dollars in motor-vehicles and coincidentally fail to demand suitable roads over which to drive them.

Had there been two or three other industries whose expansion had equaled that of the motor-vehicle and highway industry, there would probably have been no overproduction of farm products, for capital and labor would have been diverted from agriculture. Call the buying of motor-cars "extravagance" if you please, but pray that inventors will invent other new marketable types of "extravagance"—television, what not.

Including the new 1 ct. per gallon federal tax on gasoline, motor-vehicle owners would pay \$700,000,000 annually in gasoline taxes, based on the 1931 consumption. To this add \$350,000,000 in motor-vehicle license fees, and the annual "toll" for the use of the highways becomes \$1,050,000,000.

The annual cost of maintaining and repairing the roads is \$450,000,000, leaving \$600,000,000 as income, or 5 per cent on the 12 billion dollars invested in roads. Yet railroad executives are trying to persuade the public that highway users are subsidized by the public. If no gasoline taxes were diverted, our rural highways would be as self-supporting as our municipal waterworks.

▼
WHITE PAINT AS LIFE SAVER — The safety which a white tire cover affords against a rear collision in the event of a tail light going out when on a dark road amply commends its use as it will loom up in the lights of a following vehicle long before the car or truck on which it is carried will come into view.

Estimated INVESTMENT IN ROADS AND STREETS

Roads:

| | |
|-----------------------------------|----------------|
| Federal (Parks, forests, etc.) | |
| 176,000 miles at \$3,000..... | \$ 528,000,000 |
| State (graded) | |
| 35,000 miles at \$5,000..... | 175,000,000 |
| State (surfaced) | |
| 228,200 miles at \$25,000..... | 5,705,000,000 |
| County and local (graded) | |
| 2,278,000 miles at \$500..... | 1,139,000,000 |
| County and local (surfaced) | |
| 483,100 miles at \$10,000..... | 4,831,000,000 |
| Right of Way (securing easements) | |
| 3,200,000 miles at \$100..... | 320,000,000 |

Total Roads, 3,200,300 miles.....\$12,678,000,000

Streets:

| | |
|--|------------------|
| 60,000 miles at \$5,000..... | \$ 300,000,000 |
| 140,000 miles at \$30,000..... | 4,200,000,000 |
| Total Streets, 200,000 miles..... | \$ 4,500,000,000 |
| Motor Vehicles, 26,700,000 at \$700..... | \$18,690,000,000 |
| Garages, at \$100 per vehicle..... | 2,670,000,000 |
| Filling Stations (about 200,000)..... | 1,400,000,000 |

Total vehicles, garages and filling stations..\$22,760,000,000

Grand total\$39,938,000,000

Two Three-Span Bridges Moved *in Six Hours*

*Traffic Stopped Only Eighteen Hours
As Result of Successful Planning*

By LUKE BRANNON

Division Engineer, Ohio State Highway Department

WITH the opening to traffic last year of the new bridge over the Miami River on route U. S. 25 at the north edge of Dayton, what we believe to be one of the most interesting bridge replacement jobs in the state was completed. The Maxon Construction Company, general contractor, constructed the new bridge, and C. E. Foreman & Son, sub-contractors, moved the old structures before the new bridge was started on project No. ICH 61 Sec. "F-Bridge."

For a number of years, traffic on route 25 and the cars on the D. & T. electric railway line (which parallels the road but is not now in operation) used the two steel bridges which were side by side as shown in an accompanying photograph. Some time ago it was decided that the highway bridge erected in 1898 would have to be replaced by a new and wider structure, as the old narrow bridge was not considered safe nor wide enough for this heavily traveled highway.



View Along East Side of Bridges Looking North Just After Moving Started

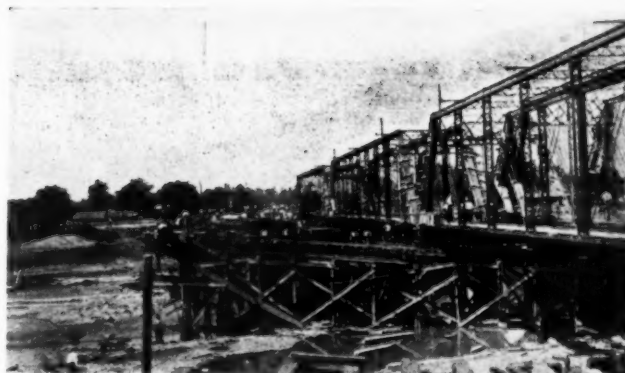
The first and most difficult job was the moving of the two steel bridges, each three spans long, as it was desirable that the new bridge be placed where the old one had been, yet traffic on this important artery could not be cut off for a very long period.

It was finally decided to move both bridges approximately 60 feet down stream, both at one time. To have moved only one successfully would have been a good task, considering their condition.

The spans were moved to their new locations by means of rollers. They were moved 59 feet and 6 inches west, 9½ inches endwise or north and up grade 5½ feet or one inch rise to the foot, all in one operation.

Because of the spans and rigging, it was necessary to raise the structure 5½ feet as they were rolled to the new location. When directly above the new resting places, they were gradually lowered to their beds, 2 feet and 2 inches higher than the old piers.

During the time the bridges were being prepared for moving, placed on rollers and braced, traffic was allowed on both spans.



Note the Rise Which the Two Bridges Are Ascending

Only four weeks elapsed between the time work started and the completion of the moving. In spite of this speed, the engineers struck within a half-inch of the given point when the spans were settled in the new locations.

The contractor employed 50 men for the moving of the bridges. They used 120 heavy-typed jacks, 124 six-inch hard maple rollers, 3,000 feet of 5/8-inch cable and thousands of feet of timber. Several rollers were crushed by the excessive weight of the bridges during the removal.

When all was in readiness, the bridges on the rollers and ready to slide up the runways, they were pulled from six different points.

Cables attached to the ends of the bridges were operated by power winches on trucks while four hand winch operated cables were attached to the centers of the spans, two at each point where the spans joined.



New Bridge Opened to Traffic. Old Steel Bridges in Background

Actual time for the moving of the two bridges, which have a combined weight of approximately 1,000 tons, was six hours. The bridges were closed at midnight and opened to traffic again at 6 p. m. the next day.

Mr. Foreman and his son were on hand during the entire time to supervise the job, one relieving the other at 18 to 24-hour intervals. They had employees on duty 24 hours a day during the entire time of preparation and the rolling.

The New Bridge.—Even before the bridges were removed, the Maxon Construction Company started the preparatory work of building the new 5-span concrete bridge.

Storm sewers of Armco paved invert pipe with flood gates attached were laid along the east side of the highway on both sides of the river to provide drainage under the wider roadway, made practical by the wider bridge. The automatic drainage gates were attached to prevent backflow and thus protect adjoining property when the

river rises. The road was widened to 40 feet for a mile north of the bridge and from there on, it is 20 feet wide.

Two hundred and fifty feet of 10-inch perforated pipe was also used to provide adequate subdrainage for the new roadway.

As soon as possible, vehicular traffic was transferred to the new bridge and the old highway dismantled. It was planned to move the D. & T. bridge to a permanent



Automatic Drainage Gates on Sewer Outlet Protect Adjoining Land from Backwater. Note Slope Protection

location 12 feet nearer its old location, but the line was abandoned before that was done.

The new bridge cost approximately \$250,000 of which about \$25,000 was paid by the county commissioners and the balance by the state. All work was under state supervision, with Matt Boylan, resident engineer, representing the state on the job, and the writer in general charge of the work.

Liaison on the Diversion Front

ROAD building in America is at the cross-roads. If this country is to continue its economically sound and socially important practice of pushing highway construction to a satisfactory conclusion—if motorists are to be able to continue paying for the paved roads they use and need—the present tendency of tax-levying bodies to divert highway funds from their intended use must not only be halted but safeguards must be set up which will protect the highway funds (raised by gasoline taxes and motor vehicle license fees for the roads to which they were pledged) as long as they shall be necessary.

Recognizing the need for concerted action—and realizing that there has never been a clearer call for sound, constructive thinking in this public activity—a number of organizations are bending their efforts toward supplying motorists, and others affected, with the necessary ammunition to conduct a winning fight against diversion. There follows a comprehensive, though necessarily incomplete, list of these organizations. Most of them are organizations of long standing. Others were formed for the express purpose of meeting the present critical road revenue situation.

Connecticut:

The Highway Taxpayers' Association of Connecticut.

Illinois:

Illinois Construction Council.

Massachusetts:

Highway Taxpayers' Association of New England, Inc.

Michigan:

Northern Michigan Road Commissioners' Association.

Upper Peninsula Road Builders' Association.

Michigan Road Builders' Association.

Nebraska:

Nebraska Good Roads Association.

New York:

New York Construction Council.

Ohio:

Ohio Good Roads Federation.

Cuyahoga County Industries Association.

Oklahoma:

Oklahoma Good Roads Association.

Pennsylvania:

Pennsylvania Construction Council.

Rhode Island:

Highway Taxpayers' Association of Rhode Island.

Tennessee:

Tennessee Road Builders' Association.

Texas:

Texas Good Roads Association.

Washington:

Washington State Highway Fund Conservation League.

Wisconsin:

Associated Wisconsin Contractors.

The following concise statement of purpose, set forth in the by-laws of the Highway Taxpayers' Association of Connecticut, is more or less typical of the objectives such organizations have set for themselves in the existing emergency:

"To employ all lawful means to encourage the continuation of the use of all money, received from taxes on gasoline and motor vehicles and from other sources and allotted by statutes to the Highway Department, for the maintenance, construction and reconstruction of highways; to promote and assist in the furtherance of all measures that will insure the use of the motorists' taxes for the purposes for which it is understood they are levied and to use every legal means to prevent undue tax burdens upon motor vehicles.

"Generally to do all such things as are incidental or conducive to the attainment of the above objects."

These organizations are squarely aligned against legislation (whether of emergency character or otherwise) which will be harmful to the highway industry and the innumerable mines, mills, factories, and laborers dependent upon it in whole or in part for their livelihood. They point out that diversion is no mere matter of shifting money from one state pocket to another. It throws into the discard the entire principle upon which road taxes are based. It will increase, rather than decrease, relief needs. Moreover, by means of diversion, motorists alone are being asked to carry the burden which is the obligation of the American public as a whole.

Diversion, then, is something that comes home to every motorist, every individual interested in the prosperity and progress of our nation. Such being the case, a large and influential section of the American public should be more than casually interested in the aims and activities of the foregoing organizations. It is to *your* interest, private as well as patriotic, to get acquainted with the group, or groups, fighting diversion in your territory. Lend them your support!

As a means of combating the various and sundry schemes to divert motor tax money to miscellaneous purposes, several of the organizations listed are making use of a battery of anti-diversion pieces produced by the Ray Press, of 633 Plymouth Court, Chicago. These include an attractive windshield sticker, printed in the national colors and carrying the slogan "Use GAS TAXES for ROADS ONLY"; 12-in. window cards, carrying the same message, for the use of merchants and other interested individuals and institutions in close contact with the public; small letter-head cuts for transferring the slogan to company and organization stationery; and two exceedingly timely folders. "Use MOTOR TAXES for ROADS ONLY" and "GET YOUR MONEY'S WORTH FROM YOUR ROAD TAXES."

CUT-BACK ASPHALTS— *Their Characteristics and Use*

By PREVOST HUBBARD
Chemical Engineer, The Asphalt Institute

Part II—Use

(Continued from January issue.)

Highway Uses of Cut-Back Asphalts.—Cut-back asphalts are used for a variety of purposes in the treatment, construction and maintenance of highways, among which may be mentioned the following:

1. Priming road surfaces preparatory to surface treating, seal coating or constructing an asphaltic wearing course.

2. Surface treating and seal coating road surfaces to produce a thin asphaltic carpet with a cover coat of selected mineral aggregate.

3. Preparation of road-mixes with various types of mineral aggregate for the purpose of constructing wearing courses of substantial thickness.

4. Preparation of plant mixes with various aggregates, to be spread and compacted in an unheated condition. Such mixtures are used in the construction of foundations and wearing courses and for cold patching.

The characteristics which the cut-back asphalt should possess will vary markedly with the purpose for which it is to be used, the character of mineral aggregate with which it is combined and the time in which it is expected to harden, also with the character of the final hardened product that it is desired to secure. The initial viscosity of the product is of paramount importance. For some purposes, it is necessary that the cut-back asphalt have an extremely low viscosity and for other purposes, that the viscosity be just as high as it can be made and, at the same time, permit its admixture with the mineral aggregate with which it is to be combined. High viscosity is particularly important in connection with mixtures which are to be laid and compressed immediately after preparation.

Priming.—The function of a primer is to so prepare an existing road surface as to make it adaptable for additional treatment. Primers are used mainly on water-bound types of surface, such as earth, sand-clay, gravel and macadam. All of these surfaces carry an appreciable amount of dust, or fine material, passing the 200-mesh sieve, which tends to repel viscous products rather than to absorb them. A primer should therefore be of low viscosity so that it will be readily and completely absorbed by the surface which is to be treated, after which it should harden so as to consolidate and assist in waterproofing the surface. While acting as a dust layer for dust which may be present, a primer is not essentially a dust laying oil nor should it be expected to serve as a binder for aggregate cover that may be later applied. A liquid non-volatile residual oil is usually more satisfactory to use from a purely dust laying standpoint, and a much more viscous cut-back asphalt is more satisfactory to use as a binder for cover aggregate. It is therefore a mistake to attempt to produce a single material which will serve as a primer, as a dust layer, and also as a binder.

For earth and sand-clay surfaces, the Furol Viscosity

of a primer at 77° F. should preferably be lower than 150. It has been found that if a suitable distillate is used in its preparation, a viscosity between 40 and 150 at 77° F. will permit it to penetrate into an earth or sand-clay surface within twenty-four hours, and often within a shorter period. Gravel and macadam roads which do not carry such a high percentage of extremely fine material, absorb such a primer much more readily, usually within a few hours. It is therefore possible to utilize a product with a somewhat higher viscosity for such surfaces, although it is not essential to do so and for this reason, a primer having the viscosity limits above mentioned, can be successfully used for all types of surfaces.

It has been found that cut-back asphalts, produced with very volatile distillates or with distillates carrying a high percentage of very volatile hydro-carbons, will not penetrate a dense fine grained surface no matter how low its viscosity may be. There are two reasons for this, the first being that the very light portion of the distillate volatilizes so rapidly after such cut-back has been applied that the viscosity of the product is raised to such an extent as to prevent penetration. The other reason is that the more volatile the distillate the less perfect its solvent action for the asphalt and the more readily will it separate from the asphalt by preferential absorption into the fine material of the road surface. The net result is that the asphalt in the cut-back is deposited on the surface rather than being carried into the surface. A type of distillate, comparatively free from the very light low boiling hydro-carbons, is much to be preferred, as it is an excellent solvent for the asphalt and readily carries it into the surface, after which the solvent separates to a large extent by preferential absorption into the fine material, leaving the dissolved asphalt deposited in the upper portion of the road and itself penetrating to a greater distance.

Within the last two years, a primer of this nature has been developed which has proven extremely satisfactory for the purpose, although prior to that time attempts to utilize asphaltic products for priming were far from satisfactory because the character of the distillate which should be used in its preparation was not clearly understood.

The exact consistency of asphalt base left in the upper portion of the road surface is not of material consequence, and a primer which, upon distillation to 680° F., yields a residue with a penetration of less than 300, may be considered as satisfactory.

As previously stated, a primer should not be expected to hold a cover coat of aggregate because it should be completely absorbed into the road surface. Where the original road surface is well bonded, treatment with a primer, such as described, will hold the surface intact under traffic to a considerable extent without producing

a sticky or tacky surface condition. It is not, however, to be recommended for use without some subsequent treatment of the surface with asphaltic material, except perhaps in the case of well drained and well consolidated earth roads. In this field, which has not as yet been thoroughly explored, it gives promise of producing satisfactory results without requiring the use of other asphaltic products as an adjunct.

Surface Treating and Seal Coating.—Where the purpose of a surface treatment is to build up a thin waterproof bituminous carpet course with a light cover of mineral aggregate, the cut-back asphalt should cure or harden to a soft asphalt cement as rapidly as possible after application. Its distillate constituent should therefore be readily volatile. As has been pointed out, a product of this nature is not easily absorbed by a fine grained surface and, if the surface is at all dusty, the deposited asphalt may not bond firmly to the road. For such surfaces an initial treatment with a primer is highly desirable and, in some cases, necessary. Such preliminary treatment completely bituminizes the road surface and insures a firm bond with the asphalt which is later used in the construction of the bituminous carpet. In the surface treatment of an old bituminous road, or one which has been previously surface treated, use of the primer becomes unnecessary and should be eliminated if the road is first thoroughly cleaned.

The viscosity of the surface treating cut-back asphalt should be sufficiently low to permit of its ready application at almost any desired rate per square yard without penetrating, by means of a pressure distributor. A viscosity of from 80 to 160 at 77° F., permits of such application in warmer summer weather and only slight warming is required in cool weather. While a more viscous product of the same type would produce satisfactory results, the necessity of invariably preheating it largely offsets its inherent advantage as a cut-back, for the reason that a soft asphalt cement could be applied in a similar manner to equal advantage. The cut-back for surface treatment, when subjected to the distillation test, should yield an asphalt with a penetration preferably between 60 and 120. Such a product, shortly after application, leaves a residue upon the road surface which will firmly cement together a cover of stone chips or gravel free from dust.

Mineral Aggregates for Road or Plant Mixing.—The characteristics of cut-back asphalt, suitable for the construction of wearing courses of substantial thickness, vary considerably with the characteristics of the mineral aggregate which is selected for use. Whether or not the aggregate contains an appreciable amount of dust

or fine particles passing the 200-mesh sieve is the most important consideration.

Two well defined road-mix and plant-mix types of construction have been developed during recent years in which the mineral aggregates are sharply defined. In one of these, which has been termed the macadam aggregate type, practically no 200-mesh material is present and in fact nearly all of the aggregate is retained on the 1/4 inch screen. For such a product, commonly known as cleaned crushed rock, a quick curing cut-back asphalt of suitable viscosity should be used.

In the other, known as the graded aggregate type, a substantial percentage of 200-mesh particles is present, usually specified as between 7 and 14 per cent. There is also a relatively high percentage of sand or particles passing the 10-mesh and retained on the 200-mesh. With such an aggregate, mainly because of the presence of 200-mesh particles, a quick curing cut-back asphalt will not readily mix and troublesome balling is likely to occur if it is used. This is due to the same basic considerations which have been discussed in connection with primers. The type of cut-back best suited for such an aggregate is therefore similar to a primer but of considerably higher viscosity. In other words, the distillate which is present in the cut-back should be comparatively free from very light low-boiling hydro-carbons.

Between these two distinctive types of aggregates that have been pretty well standardized, there are a great variety of gradings found in material deposits which, in many cases, can undoubtedly be used to advantage in road-mix or plant-mix construction for light traffic. This field has as yet been explored to only a limited extent. There are, however, a few fundamental considerations that should govern the selection of a cut-back for use with any aggregate.

1. The original viscosity of the cut-back should be as high as will permit of the production of a uniform mixture by the method which is to be used.
2. For coarse open aggregates which contain little or no material passing a 1/4 inch screen, a quick curing cut-back should preferably be used.
3. For fine open aggregates which contain little or no 200-mesh particles but a high percentage passing the 1/4 inch screen, a medium curing cut-back of relatively high viscosity is frequently most suitable.
4. For close graded aggregates or those which contain an appreciable percentage of 200-mesh particles, a medium curing cut-back is required.
5. Other things being equal, the finer the aggregate or the smaller the average diameter of particle, the lower

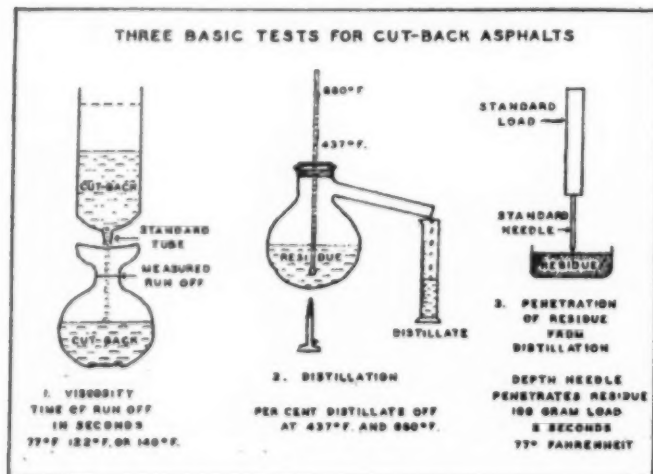


Fig. 3

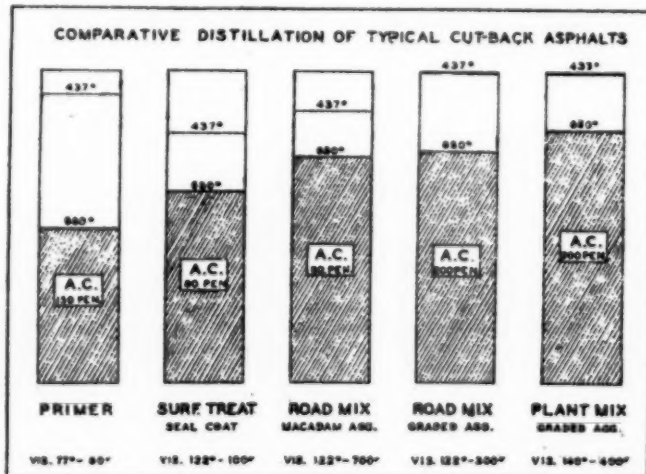


Fig. 4

must be the viscosity of the cut-back unless the aggregate is heated prior to mixing.

6. For plant-mixing with any given aggregate, a more viscous cut-back should be used than for road-mixing.

Open Aggregate Mixtures.—For mixes with a coarse open aggregate, such as the macadam aggregate type, it is desirable to build up on the individual particles, as thick a film of asphalt as possible. When the mixture is made on the road this usually requires at least two applications of the cut-back with an interval of mixing which permits the first application to harden and cure by volatilization of its lighter constituents. Repeated light applications of a quick curing cut-back asphalt of very low viscosity may be made to produce the desired result, but it is more economical and efficient to use one of just as high viscosity as can be conveniently mixed by the road-blade or other road mixing device. With the exception that the higher viscosity is produced by the presence of a smaller proportion of distillate, the type of cut-back is identical with that described for surface treatment.

For cool weather mixing or when the mixtures is to be stock piled for cold patch work, a Furol Viscosity at 122° F. of from 200 to 400 is recommended. For construction in warm summer weather, it is advantageous to use a product with a Furol Viscosity at 140° F. of from 275 to 400. For cold laid plant mix construction, a Furol Viscosity at 140° F. of as high as 700 to 1400 is desirable. In all cases, the cut-back should be warmed before mixing, but preheating of the aggregate is unnecessary except sometimes for the purpose of drying it before use in the preparation of plant mixes. Aeration of the mix before it is compressed is essential to the development of asphalt coatings of high binding value when the original cut-back is of relatively low viscosity.

When the aggregate is practically free from 200-mesh particles but has a high percentage of material passing the $\frac{1}{4}$ inch or 10-mesh sieve, selection of the best type and grade of cut-back becomes a matter of judgment. If the aggregate has high inherent stability a quick curing cut-back, after warming, may sometimes be used to advantage in the preparation of plant mixes. For road-mix construction, however, and in all cases where it is expected that occasional blade maintenance may be required, a medium curing cut-back of relatively high viscosity is to be preferred.

Dense Graded Aggregate Mixtures.—For practically all of the dense graded aggregates, which contain a relatively high percentage of 200-mesh particles, use of a medium curing cut-back asphalt is required for reasons that have already been set forth. Incomplete curing or hardening within the body of the mixture, when newly laid and consolidated, is desirable as it permits reworking and shaping by means of a blade if the original construction becomes rough or otherwise unsatisfactory. After admixture with the aggregate the asphaltic material should, however, become sufficiently viscous to resist displacement by water and should thoroughly waterproof the mixture itself.

For road-mix construction with this type of aggregate, it is necessary that the original product be of lower viscosity than is desirable from a waterproofing standpoint, in order to facilitate the mixing operation. In cool weather a medium curing cut-back asphalt with a Furol Viscosity at 140° F. of from 150 to 250 may be used but in warm weather it is possible to satisfactorily manipulate one, with a viscosity at the same temperature of from 300 to 500, which is preferable. In plant-mix construction, one with a viscosity at 140° F. of from 500 to 800 may ordinarily be used. The percentage of

200-mesh material, however, has some bearing upon the most desirable range of viscosity and lower viscosity products must be used with high dust aggregates than with low dust aggregates.

While aeration of the mixture slowly increases the viscosity of the medium curing cut-back, preferential absorption of distillate by the 200-mesh material also plays an important part in curing. After compaction, which is usually affected by traffic, the medium curing cut-back at the surface hardens quickly to a soft asphalt cement to produce a waterproof seal. The curing process below the surface is, however, much more gradual and this is desirable for aggregates which are sufficiently dense and stable to produce, without a bituminous binder, what would ordinarily be considered as a good water-bound road.

For all of the medium curing cut-back asphalts used in road-mix or plant-mix construction, the residue from the distillation test should preferably show a penetration of from 100 to 300 at 77° F.

It is not the object of this paper to develop detailed specifications for cut-back asphalts but rather to describe variations in their composition and characteristics as related to their various uses. From this discussion, it is evident that the fundamental tests which determine their suitability for a given use are first, original viscosity; second, character of distillate present; and third, consistency or penetration of residue obtained from distillation. These three tests are illustrated in Fig. 3 and characteristics of a few selected types and grades of cut-backs are shown in diagrammatic form in Fig. 4.

Acknowledgement.—This paper was presented at the Tenth Annual Asphalt Paving Conference held last month at New Orleans.

So This Is Diversion!

"Expressed in simplest terms, what are the effects of diversion as practiced by some seventeen states and threatened by others in their efforts to raise emergency funds at all costs?" It would be impossible, in the space allotted, to cover all the ground opened by that query; but here, in condensed form, are some of the more important points involved in the diversion of funds which are legally and morally pledged to highway improvement:

Taking money away from road funds for unemployment defeats its own purpose—increases rather than decreases relief needs.

Diversion entrenches the dole.

It throws into the discard the principles upon which road user taxes are based.

It violates the law in many instances. At best, it is a breach of faith with the motoring public.

It places an unfair and uncalled-for burden on motorists. Common justice dictates that the costs of relief should be borne by the public at large. Diversion makes the gas tax a class tax.

It jeopardizes past investments in highways.

It means, inevitably, the curtailment and eventual interruption of vital highway programs.

Finally, the point is generally overlooked that, when the states borrow from the R. F. C., they are reducing future federal aid for road work to the extent of their borrowings. U. S. loans to states for direct relief, unless repaid from general revenues, will be collected by deductions made from future federal funds for roads. And that, according to W. C. Markham, Executive Secretary of the American Association of State Highway Officials, is diversion with a vengeance.

EDITORIALS

Public School Teachers Would "Fire" Road Workers!

AT a recent conference of educators in Washington, Secretary Wilbur said:

"We can take a billion now spent for highways and put it into the schools. With about forty-four legislatures now meeting, why not boldly challenge the highways in favor of the schools?"

Yes, why not? But why not cut the school expenditures in half? In 1920 the total expenditures for education in public schools below the college grade were \$1,036,151,000. In 1930 those expenditures were \$2,316,790,000. During that period the number of pupils increased only 20 per cent whereas the cost of educating them increased 123 per cent! If there has been any improvement in the mental training, we have failed to see it. Indeed most employers complain that the mental training of public school children is not so good as it was a decade ago.

This educational conference, of which Secretary Wilbur was chairman, had as its avowed object "the consideration of ways and means of continuing educational facilities unimpaired," but its real object is clearly disclosed in the above quotation, namely, to prevent a reduction in the salaries of teachers, even if to accomplish this end all those engaged in highway maintenance and improvement must be "fired." This is one of the most amazing attempts on the part of one body of public employees to profit at the expense of another body of public employees.

In passing let it be added that during the 20 years between 1910 and 1930 the salary of the average public school teacher increased 193 per cent, as compared with an increase of 106 per cent for the average common laborer engaged in public road building.

If there is any class of employee, public or private, that received as great an increase in wages during those two decades as public school teachers have received it is not recorded in the Statistical Abstract of the United States or in the wages and salary statistics compiled by the Bureau of Labor. As nearly as can be estimated the average wage of all Americans engaged in gainful occupations, increased about 105 per cent between the years 1910 and 1930, while public school teachers enjoyed nearly twice that gain. Yet they have the effrontery not merely to resist demands for decreases in their salaries but to ask virtually for the discharge of all men engaged in roadwork, so that they may continue to enjoy salaries that have risen out of all proportion to those paid to the rest of their fellow citizens.

Sympathy for Railway Workers Is No Justification for Antipathy Toward Highway Workers

RAILWAY officials have given much publicity to the fact that insurance companies, loan and trust companies and savings banks are among the largest owners of railway bonds. An analysis of the assets of these fiduciary institutions shows that only 10 per cent of their assets consist of railway securities.

It is regrettable that these railway securities have shrunk in value. It is just as regrettable that the real estate mortgages held by the same fiduciary companies

are mortgages upon property whose market value has decreased much more than the decrease in value of railway property.

While railway officials naturally try to enlist sympathy by pointing out that fiduciary institutions have been injured by the decline in the value of railway securities, they overstep the bounds of propriety when they attempt to picture the railways as having been great sufferers from the competition of motor-trucks, and therefore entitled to legislative protection against that competition. In another editorial we show that in spite of that competition railway freight ton-mileage increased 23 per cent during the ten years ending in 1929. In 1926 the railways carried 447 billion ton-miles, and in 1929 they carried 450 billion ton-miles, or an increase of nearly 1 per cent during the very years when the number of motor-trucks was increasing most rapidly.

The railways are entitled to all the sympathy that they seek, but we object to their using sympathy as a weapon against the workers in the so-called competitive field of highway transportation.

The Enormous Growth of Railway Revenue in the Face of Highway Competition During the Decade Ending in 1929

RAILWAY executives complain that trucks and buses have recently caused great losses in rail revenues, but statistics do not support the contention:

| Year | 1919 | 1929 |
|-------------------------|-----------------|-----------------|
| Freight revenue..... | \$3,624,886,000 | \$4,899,168,000 |
| Passenger revenue | 1,193,431,000 | 875,929,000 |
| Total | \$4,818,317,000 | \$5,775,097,000 |

These two years, 1919 and 1929 were both years of prosperity, and are therefore comparable. The total revenue from freight and passenger traffic increased nearly 20 per cent, so up to the time of depression there was a substantial gain in that revenue.

While it is true that passenger revenue decreased 26 per cent, freight revenue increased 26 per cent. In 1919 and prior thereto freight revenue averaged about three times the passenger revenue.

Freight rates averaged 0.99 ct. per ton-mile in 1919 and 1.09 ct. in 1929, which is a 10 per cent increase. Passenger rates averaged 2.55 ct. per passenger mile in 1919 and 2.81 ct. in 1929, which is a 9 per cent increase.

Passenger miles reached a maximum in 1920, totaling 47,370 millions. In 1929 the total was 31,165 millions. This great decline is but slightly due to bus transportation, for privately owned automobiles have been steadily growing in popularity as a means of transportation even over long distances. Nearly every employer of traveling salesman can testify to their frequent use of motor cars instead of trains. With the increase of improved highways during the decade ending in 1929, there came a great increase in automobile travel both for business purposes and for pleasure, which necessarily reduced transportation by rail.

During a trip through Yellowstone Park last summer the editor was greatly impressed by one change that had occurred since his previous trip ten years before. The hotels were nearly empty whereas ten years ago they were

crowded with tourists who had come to the park by rail. On the other hand during the last summer the automobile camps were crowded with tourists who were "rolling their own" over the fine highways that lead to the park, and the still finer highways in the park.

Railway officials should not blame motor buses with the loss of much of their passenger traffic. Rather should they attack the private motorist for preferring to "roll his own."

In 1919 the rails carried 367 billion ton-miles of freight, and in 1929 the total was 450 billion ton-miles, an increase of 23 per cent in ten years. In 1925 this ton-mileage was 417 billion, so whether we take the entire decade or the last four years ending in 1929, we see that motor-trucks had not cut into freight traffic by rail. On the contrary, never in their history had the railways carried as large a ton-mileage as in 1929.

But in order to enlist sympathy for themselves and antipathy toward their highway competitors, railway executives have been publishing statistics showing great decreases in both freight and passenger revenue since 1929. The truth is that those losses reflect the effects of a great financial depression and not the effects of competition with trucks and buses. In order to bring this fact very clearly we have quoted the statistics above given relative to rail traffic in 1919 and 1929, for 1929 was the last year whose traffic was unaffected by the depression.

We urge railway officials to cease their attacks upon highway users, and to devote their energy toward securing public support of legislation that will relieve the railways from the strangling rate regulation that has been inflicted upon them for two decades by both state and federal commissions.

Twice as Many Highway as Railway Workers

FEW people know that the highway transportation "plant" normally keeps twice as many men busy as does the corresponding railway "plant," when both the builders and operators of these utilities and their rolling stock are included.

The U. S. Census for 1930 is our authority for the following figures:

| HIGHWAY TRANSPORTATION | |
|--|-----------|
| Foremen, highway work..... | 23,250 |
| Laborers, building and repairing..... | *290,354 |
| Other highway workers..... | 85,717 |
| Laborers, street cleaning..... | 16,673 |
| Chauffeurs and truck drivers..... | 972,418 |
| Bus conductors..... | 1,002 |
| Garage owners and managers..... | 69,965 |
| Garage laborers..... | 66,693 |
| Laborers, truck, transfer and cab companies..... | 40,970 |
| Owners and managers of those companies..... | 41,084 |
| Gas station workers..... | 89,190 |
| Repair shop workers..... | 22,105 |
| Mechanics, automobile factories, garages and repair shops..... | 394,188 |
| Operatives, automobile factories..... | 161,957 |
| Operatives, automobile repair shops..... | 9,452 |
| Laborers, automobile factories..... | 123,717 |
| Laborers, automobile repair shops..... | 12,653 |
| Operatives, rubber factories..... | 80,835 |
| Laborers, rubber factories..... | 29,123 |
| Total | 2,531,346 |

*Many laborers working for contractors undoubtedly were not listed in the Census. During the month of August, 1932, a total of 328,399 men were employed on work for state highway systems and 4,601 on work on roads in Federal Forests and Parks.

This total does not include highway contractors and their managerial staffs, nor highway officials and their staffs, nor civil engineers engaged in highway work,

nor any workers engaged in office work such as book-keepers, stenographers, clerks, etc.

| STEAM RAILWAY TRANSPORTATION | |
|---|---------|
| Foremen and overseers..... | 73,910 |
| Laborers, including construction labor..... | 435,058 |
| Mechanics, railroad and car shops..... | 21,847 |
| Operatives, railroad and car shops..... | 65,008 |
| Laborers, railroad and car shops..... | 37,789 |
| Locomotive engineers..... | 101,201 |
| Locomotive firemen..... | 67,096 |
| Motormen, steam railways..... | 2,754 |
| Conductors..... | 73,332 |
| Brakemen..... | 88,197 |
| Switchmen and flagmen..... | 92,217 |
| Yardmen..... | 7,948 |
| Ticket and station agents..... | 27,160 |
| Baggagemen and freight agents..... | 16,377 |
| Inspectors..... | 39,079 |
| Mail clerks, railway..... | 17,397 |
| Express messengers..... | 8,211 |
| Other employes..... | 42,619 |
| Officials and superintendents..... | 34,380 |

Total1,251,580

This total does not include the clerical staff of the railways, nor the civil engineers, etc., and is therefore comparable with the total engaged in the highway transportation industry. But it should be remembered that farmers and many others who operate motor-trucks are not classed by the census as being engaged in transportation, in spite of the fact that many of them spend a considerable part of their time driving trucks.

Many railway employees belong to railway unions, whereas very few men engaged in the highway industries are unionized. The consequence is that many state legislatures have been led by propagandists to believe that the interests of men engaged in railway transportation are more important than the interests of men engaged in highway transportation.

The highway "plant" closely resembles the railway "plant." Each has roadways that must be continuously maintained and improved if there is to be economic transportation. Each has rolling stock, although in the case of the railways nearly all of it is owned and operated by the railway companies, whereas in the case of the highways nearly all of the rolling stock is owned and operated by individuals and a multitude of small corporations.

Each of these two great transportation plants is essential to our economic welfare. Each has certain functions that it can unquestionably perform most economically. There is a "border line" service that each believes that it can render at less cost than its competitor can render it. Shall government undertake to act as arbiter in such complex matters? Or shall the competitors be left to demonstrate by their rates of charge which is the more economic?

Is there any good reason why a railway company should be protected against the competition of trucks and buses, when merchants, manufacturers and farmers are not protected against competition?

These are a few of the questions that legislators will be called upon to consider.

Illogical Business Indices

ALTHOUGH beginners in arithmetic are taught not to add peaches to pears, there is scarcely a political or business economist who obeys this quantitative rule when he undertakes to measure the fluctuations in business activity. For example, "The Business Week" publishes a chart that purports to show the weekly changes in business activity in America, arrived at by averaging eight different indices, namely, those relating to:

1. Steel mill operations

2. Building contracts
3. Bituminous coal production
4. Electric power output
5. Non-bulk carloadings
6. Check payments outside New York
7. Commercial loans of reporting Federal Reserve member banks.

8. Currency in circulation.

These eight indices are all percentages of "normal," each being equated for seasonal fluctuation. So at first blush it looks as if peaches were not being added to pears and six other fruits in order to strike an average. But a percentage has no significance unless it relates to a given kind of thing. So adding percentages of different things is equivalent to adding different things, which is a meaningless procedure. Add 60 per cent of normal carloadings to 105 per cent of normal currency in circulation, and what have you got? One hundred and sixty-five per cent of normal carloadings plus currency. Figure out what it means if you can.

There is only one sort of unit in which all these eight things can be expressed, namely, a money unit, like the dollar. But since there are price fluctuations that vary in each of the first five of these eight things a price index should be applied to each of them. Then the five resulting indices should not be averaged without weighting each of them. Furthermore, all overlaps should be deducted. Since currency in circulation is not a weekly output it should not be added to the first five, which are weekly outputs. Check payments are summations of business transactions and come nearer to being a true index of business activity than any of the other seven or all of them combined on a weighted dollars basis.

Check payments in New York City ordinarily include such a great volume of stock market transactions that are pure gambling as to be unsatisfactory as a measure of commercial transactions. Hence check payments outside of New York City form a better criterion of commercial activity; but since there has been such a great decline in commodity prices and wage rates during the last three years, check payments should be equated to allow for these price and wage changes.

It is our opinion that an index of per capita bank clearances outside of New York City, equated for changes in prices and wages, is the best single index of business activity. Another useful index is obtained by dividing weekly bank clearings by total individual deposits in banks, for this shows the velocity of circulation of money. These and allied matters are discussed at length in the second chapter of Gillette's Handbook of Construction Cost, which relates to wage and price changes and business cycles.

▼ **Rail and Highway Development During Ten Years Compared**

IN 1929 the railways carried 450 billion ton-miles of freight. While there is no record of the ton-miles of freight carried by trucks, the Bureau of Railway Economics estimated the total at 16 billion ton-miles in 1929. This does not mean that trucks have taken this business away from railways, but that, in part, they have taken it away from horse-drawn vehicles and, in part, have created freight traffic that did not exist before. In 1919 the railways carried 367 billion ton-miles.

There are about 2,200,000 trucks owned by 2,200,000 individuals, of whom about 900,000 are farmers. Obviously nearly all of these men are not rail competitors, but are feeders of much freight to the railways.

There are 3,500,000 trucks, less than 7 per cent of which exceed a two-ton rated capacity. Surveys by the government show that 3,000,000, or 86 per cent of the total, are privately owned and operated.

The total passenger-miles carried annually by motor-cars can be roughly estimated by assuming 6,000 miles traveled annually per car, and 1.5 riders as the average per car. In 1929 there were 23,000,000 passenger cars, buses and taxis. Hence about 200,000 millions of passenger-miles were carried that year. This is nearly seven times the passenger-miles carried by railways.

In 1929 there were, in round numbers, 2,300,000 freight cars and 3,400,000 trucks, but the average freight car had about 20 times the capacity of the average truck. Between the years 1919 and 1929 the number of trucks became 4-fold, whereas the number of freight cars decreased, although their total carrying capacity increased 7 per cent. This indicates a relatively stationary condition of railway capacity to carry freight during a time when motor-trucks increased more than 300 per cent in number. Doubtless this amazing increase in number of trucks has unduly alarmed railway executives, for otherwise it is hard to account for the panic that has seized them, leading to the most unfounded attacks upon the owners of motor-trucks.

In 1919 there were 56,000 railway passenger cars, but only 54,000 in 1929. However, the average capacity per car had risen from 41.9 to 46.3. As contrasted with this stationary condition of railway capacity to carry passengers, we have 6,800,000 passenger motor-vehicles registered in 1919 and 23,100,000 in 1929—an increase of 240 per cent. This is the most remarkable growth that any great utility has ever experienced. It has been so rapid that highway improvement has lagged far behind the growth in use of motorcars.

Of the total of nearly 3,000,000 miles of rural roads in 1921, only 13 per cent were classed as "surfaced," as compared with 23 per cent in 1930. Since any road that was surfaced with the poorest sort of gravel or sand-clay mixture is classed as "surfaced," it is evident that highway improvement has lagged far behind the economic needs of the motorists. This is even more clearly brought out when we consider the percentages of "high type" road mileage which were 1.6 per cent in 1921 and 4.2 per cent in 1930. Under "high type" are included "bituminous macadam," sheet asphalt, concrete and brick roads.

Railway line mileage scarcely increased at all during the decade ending in 1929, the increase being less than 1 per cent, but there was an increase of about 8 per cent in the total track. Almost equally disappointing was the increase in electrified mileage, which was less than 1,500 miles of main line track. Railway stagnation in this respect, as in most other respects, is not attributable to railway executives but to the starvation rates of charge for rail service prescribed by law and by the Interstate Commerce Commission. When a railway is not permitted to earn more than 6 per cent on the value of its property without suffering the "recapture" of half its net earnings in excess of 6 per cent, the investing public is certain to refuse to invest in many railway additions and improvements.

A transportation system outrageously hampered by public regulation was bound to stagnate. On the other hand, a transportation system not thus hampered was bound to thrive if it rendered a service desired by the public.

H. P. Gillette

The Road Builders' News



A Monthly Newspaper
for
Highway Progress



FEBRUARY, 1933

Highway Builders Pool Ideas

URGE CONTINUATION OF ROAD PROGRAMS TO CREATE JOBS

Construction of low cost roads to bolster the industry and increase employment throughout the nation was urged Tuesday, Jan. 17, at the convention of the American Road Builders Association. Congestion caused by parking came in for a battery of attacks in a committee report.

Committee and division meetings took up the greater part of the day for members of the Road Builders' Association, sessions being held at the Municipal Airport and the Fort Shelby Hotel. Public officials from many states participated in the meeting at which low-cost roads were advocated to put the highway industry on its feet. The community value of low-cost roads in rural and urban regions was touched upon by speakers.

SURVEYS ARE REPORTED

Reports on highway transportation, county roads and highway conservation, as well as taxation and parking problems, were read at the group meetings. Surveys on parking problems in such widely scattered points at New Jersey cities, Los Angeles and other communities in California, as well as metropolitan regions in the Middle West, were embodied in the parking report.

A summary accompanying the voluminous reports on the parking problems declared:

"The outstanding conclusion that must be reached is that the value of the street space occupied by automobiles in most cities is out of proportion to the benefits which accrue either to the owner of the vehicle or to the merchant with whom he is supposed to do business. A careful perusal of these papers will show that city officials are justified in restricting parking privileges to facilitate the movement of traffic or to reduce accident hazards.

TAX DIVERSION OPPOSED

Opposition to the diversion of taxes on gasoline and weight of motor vehicles

from highway construction purposes was expressed in a report Tuesday by the City Officials' Bureau of the American Road Builders' Association. The report reiterated the demand made last year by the bureau for the allocation of 30 per cent of gasoline taxes for the use of cities in paving improvements.

"Appropriations for repair and maintenance of city streets is altogether inadequate," the report declared. "When any of these funds are available, it is through the courtesy of county officials, and almost without exception for use on state highways or connecting links."

To stop gas tax diversion and to create new jobs speakers urged industry to combine with labor in making the move nationwide.

That the diversion of motor tax funds seriously threatens to retard road building, as well as use of automobiles, was asserted by B. E. Hutchinson, chairman of the board, Plymouth Motor Corp., in commenting on one of the major problems confronting the Highway and Building Congress. He said that taxes placed upon automobiles should be used exclusively to "construct needed highways."

Need of eliminating conflict arising through laws of various states in the regulation of motor transportation was urged at a highway transportation session of the Road Builders' Association.

Wrestling bouts were staged Tuesday night at a Congress smoker held at the airport, attended by members of the 22 groups.

HIGHWAY SYSTEMS PROPOSED

Construction of express highway systems into Detroit and other great cities was urged by F. L. Cranford, Brooklyn, past president of the General Contractors of America, at the session of that organization in the Statler Hotel, in discussing "Reviving Construction Through Self-Liquidating Projects."

Addressing the same organization, former Judge Arthur J. Lacy, Detroit, declared that the nation was "emerging from an era of hallucination during which we proceeded on the fallacious theory that we

could borrow ourselves out of debt and squander our way back to prosperity."

Rep. Joseph B. Shannon, Kansas City, assailed what he termed the growing invasion of the United States Government into business in a talk before the Associated General Contractors.

A wide variety of problems, ranging from paving and field engineering to improved sewage disposal systems were discussed at the convention of the American Society of Municipal Engineers at the Hotel Statler.

The third annual convention of the National Ready Mixed Concrete Association opened Wednesday at the Book-Cadillac Hotel. The gathering met for only one day.

The first of the two-day sessions of the National Sand and Gravel Association opened Tuesday in the Book-Cadillac Hotel. Prospects for improved markets in the business were discussed at the Tuesday afternoon session. Throngs attended the joint exposition held at that hotel by the National Crushed Stone Association, the National Ready Mixed Concrete Association and the National Sand and Gravel Association. Sessions were held Tuesday at the Book-Cadillac Hotel by the National Paving Brick Association.

(Detroit Free Press Report)

JUDGE LACY OF DETROIT SPEAKS

Pointing to loans made to European nations, he said that "The entire working capital of the United States has gone abroad." He urged the need of looking to the common interest of the country as a means of bringing about prosperity.

CORRECTION

In the January issue of the News three titles of associations participating in the Highway and Building Congress were interchanged on page 49. To correct change titles only as follows: The title "National Crushed Stone Association," third from top of page 49, should be placed where title "National Paving Brick Association" stands. The title "National Paving Brick Association" should be put in the place of title "National County Roads Planning Commission." That leaves the latter title to be put where title, "National Crushed Stone Association" stands.

THE ROAD BUILDERS' NEWS

DEMAND CONTINUE ROAD WORK

Road and street construction must go on if there is to be any stemming of the unemployment tide.

This summarizes the thought in the minds of the thousands of people who gathered in Detroit the week of Jan. 15 from all sections of the country at the Highway and Building Congress led by the American Road Builders' Association.

The twenty-two national highway and construction groups forming the Congress devoted a major part of their programs to the laying of plans to keep job-giving motor tax funds for road and street building only and to consideration of the problems resulting from the failure of the national Congress to provide Federal Aid road funds for the immediate future.

Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads, declared, "The most significant fact is that highways and highway transport are a going concern. What other major activity has held so closely to prosperity levels?"

The Highway and Building Congress adopted this terse resolution: "We demand that the revenue raised from motor vehicle fuel taxes and license fees be used exclusively for highway construction and maintenance, and we oppose the diversion of these fees and taxes to other purposes."

A firm stand was taken on the continuance of Federal Aid: "We deplore the proposal that Federal Aid to state highway improvement be curtailed or suspended at this time, and we urge Congress to continue the Federal Aid policy by appropriating during the present emergency a sum equal to that appropriated last year, and in any event not less than the revenues from Federal taxes on gasoline and tires."

The emergency general sales tax was recommended to the states as a means of evenly spreading the costs of relief.

RESOLUTIONS OF COUNTY HIGHWAY OFFICIALS DIVISION

RESOLUTION AS TO MAINTENANCE

WHEREAS, The highways of this country represent an investment of several billions of dollars of the nation's capital; and

WHEREAS, Neglect of this investment by inadequate maintenance now, means deterioration and an added tax burden for reconstruction later; and

WHEREAS, Any effort toward the curtailment of upkeep money for highways threatens traffic safety, increases vehicle operation costs, and causes a heavy loss on the capital already invested;

THEREFORE BE IT RESOLVED, That the County Highway Officials' Division of the American Road Builders' As-

sociation go on record as urging adequate maintenance as a sound economic policy.

RESOLUTION AS TO CONSERVATION OF HIGHWAY REVENUE AND CONSTRUCTION OF SECONDARY ROADS.

RESOLVED, That the County Highway Officials' Division of the A. R. B. A. is unalterably opposed to diverting funds raised from gasoline taxes and motor vehicle license revenues for purposes other than those connected with the improvement and maintenance of roads and highway transportation.

BE IT FURTHER RESOLVED, That a larger proportion of the funds raised in this manner shall be used to inaugurate programs of improved country roads which shall continue until every farmer in the nation shall have access to his markets over roads that are passable all year.

RESOLVED, That the Tentative Resolutions and Platform of the Resolutions Committee of the Highway and Building Congress are hereby approved.

RESOLVED, That the Resolutions Committee of the County Highway Officials' Division of the A. R. B. A. stresses the importance of the conclusions and recommendations made in the report on County Road Work and Its Relation to Employment by the County Committee on Public Relations as follows:

CONCLUSIONS AND RECOMMENDATIONS

It is the conclusion of the Committee that counties should so plan their road programs as to aid the employment condition. The county is the most efficient unit in relieving the local situation. In order that this work be most effective it is very essential that a welfare board be organized to investigate relief work cases.

Public construction ought to be confined to projects which are at least value producing. Road construction properly located and efficiently performed generally employs more labor than any other public work.

The projects be suited for such work include clearing of rights-of-way, cleaning ditches and culverts, grading and widening shoulders and pavements, clearing all obstructions for proper vision, widening curves, sloping banks, sewer work, and drainage.

Recognizing that more than 85 per cent of the highway dollar ultimately goes to labor regardless of the type of work or the methods utilized there should be a minimum of arbitrary restrictions as to the use of machinery. Increased hand labor methods are not justifiable except in isolated cases. Money saved by conducting projects in the most economical and efficient manner should be expended in the performance of work which by its nature would require hand labor methods whenever done.

Short-time bond issues, direct levies, and gasoline taxes are all justifiable methods to use in financing this work.

The nearest approach of harmonizing the cry for more relief aid by employment and the insistent demand for lower taxes

is in selecting such projects for relief work as are necessary and needed work, and that competent technical direction be in charge of all operations. However, projects should be a part of an anticipated public program, and not "made work" for taking care of the unemployed.

The employment of county funds by residents of cities within the county should be governed by the methods in which the money is raised. If money is raised from property both within the city and within the country, employment should be extended in proportion to the funds raised from these units having due regard to the relief needs in each.

As long as the projects undertaken are useful and needed projects, the cost economical, and the men required to give a full day's work, the dignity of government will be maintained and the work will not be looked upon as a dole.

There are two classes among the unemployed: First, those who have always worked and do not want a dole, and second, those who have never wanted to work and are looking for a dole. The first class is much larger and there need be no fear of their looking upon useful work as a dole.

GRADED AGGREGATE TYPES LOW COST ROADS DISCUSSED

Means of bringing into being a network of highways that will serve rural America through the medium of low cost construction were dealt with in a report submitted to the American Road Builders' Association at its annual convention in Detroit, Jan. 16-20. The report was prepared by a committee headed by S. E. Fitch, County Superintendent of Highways, Chautauqua County, Falconer, N. Y.

Other members of the committee are: C. L. Motl, St. Paul, Minn.; T. H. Dennis, Sacramento, Calif.; John T. Donaghey, Madison, Wis.; D. B. Miller, San Francisco, Calif.; Geo. E. Martin, New York City; H. S. Perry, Columbus, O.; J. W. Powers, Phoenix, Ariz.; Arthur C. Waller, Boise, Idaho; B. E. Gray, New York City; A. R. Taylor, Pittsburgh, Pa.; and V. J. Brown, Chicago, Ill.

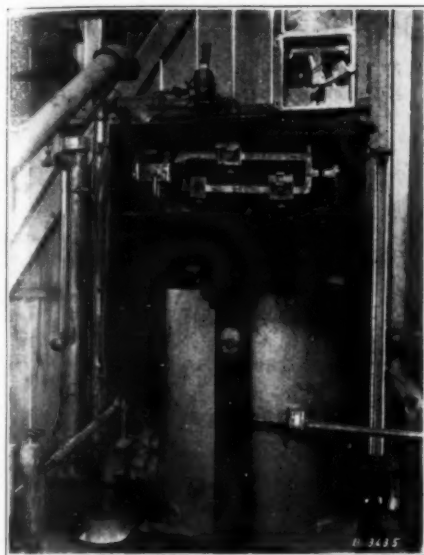
Graded aggregate type mixtures for this character of roads which will lift out of the mud that part of the populace which lives along two and one-half million miles of highways was the special subject of the committee. The report pointed out that four ends are being served by these highways where construction actually is under way.

These include the advantage that the farmer is being provided with an all-season highway, that rural territory is being opened up to city markets, that taxes are being reduced, and that work relief is being vastly accelerated. Fitted precisely to the traffic needs they serve, these highways easily can justify themselves from the standpoint of cost, the report declares.

New Equipment and Materials

New Automatic Water Measuring Tank for Concrete Mixing Plants

A new automatic water weighing and measuring tank for concrete mixing plants has been brought out by Blaw-Knox Co., Pittsburgh, Pa. Essentially, this unit consists of a cylindrical water tank mounted on a platform scale. The scale is equipped with a double beam, both beams being graduated in gallons. The required number of gallons of water is established



Blaw-Knox Automatic Water Tank.

by means of the poise on the upper beam. Deduction for moisture contained in the aggregate is obtained by setting the poise on the lower beam with the number of gallons of water in the aggregate. This is all the setting that is required.

The inlet valve is opened by means of a pushbutton control located in any position on the plant that is convenient. Water flows into the measuring tank until the weighing beam balances. The weighing scale is equipped with a springless type indicator which includes electrical contact, so that when the beam is level contact is made and the electrically controlled inlet valve is instantaneously closed. Discharge of the water from the tank to the mixer is either manually operated or arranged for mechanical operation with remote control.

The water weighing tank is also equipped with a glass gauge and calibrated scale to show the number of gallons of water in the tank at any given time. In addition there is a riser pipe in the water supply line so arranged that water hammers, due to the instantaneous closing of the inlet valve, are absorbed without shock. A strainer is also placed ahead of the inlet valve to remove soot and foreign material from the water.

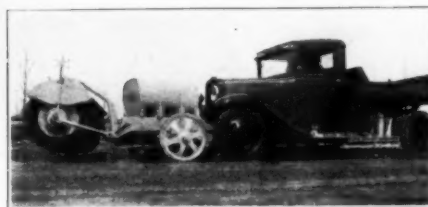
The advantages claimed for this water weighing tank are extreme accuracy, au-

tomatic operation and simplicity of installation.

Improved Model of Willett Road and Street Sweeper

The Willett Manufacturing Co. of Grand Rapids, Mich., announces a new improved model of their Willett road and street sweeper, which is a self-contained truck sweeping attachment for mounting on the front end of light-duty trucks. It steers in the same radius with the truck, having synchronized coupling to truck steering mechanism, hence it can be accurately and quickly guided around parked cars and the rotating brush can be darted in and out with great facility. All controls for operating the Willett sweeper are mounted in the truck cab.

The Willett sweeper is so designed that it can be attached to or detached from the truck in 15 or 20 minutes' time, once the installation has been made, thus quickly releasing the truck when needed for other uses. The 7-ft. brush is mounted at an angle so that it sweeps a path 6 ft. 6 in. wide. The Willett sweeper is driven from power-take-off mounted on right side of truck transmission, the drive from the



Improved Willett Road and Street Sweepers.

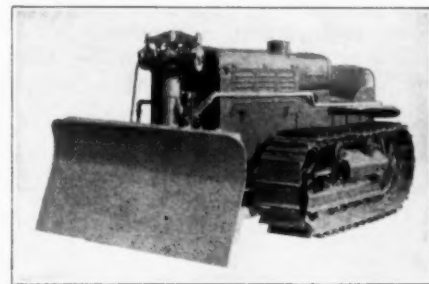
power-take-off being transmitted by short roller chain to a gear mounted on end of sweeper drive shaft, which is supported from the truck frame. The forward section of sweeper drive shaft is constructed with square sliding universal joint to compensate for uneven travel between sweeper and truck. The sweeper is equipped with hydraulic mechanism for the raising and lowering of the rotating brush, which can be quickly and easily stopped and held in position at any intermediate point. The brush when raised clears the ground from 6 in. to 8 in.

The Willett Manufacturing Co. has made an ingenious combination by mounting a light-duty Willett spring-scraper underneath the truck chassis on the same truck with the sweeper, each machine being mounted and operated entirely independent of the other, one machine being used for scraping and smoothing ruts out of gravel and dirt streets, and the sweeper can be operated for the cleaning of paved surfaces. Each of these machines can be dismantled in a few minutes' time when it is desired to use the truck for other purposes.

New Hydraulic Bulldozer

A new hydraulic bulldozer for the McCormick-Deering T-40-TracTrac-Tor is being introduced by the Frank G. Hough Co. of Chicago.

Built exceptionally simple and rugged, this new bulldozer, according to the manufacturers, embodies ten years' experience in successfully manufacturing hydraulic



New Bulldozer.

dirt moving tractor equipment. Strength is a feature of the design; the blade is $\frac{5}{8}$ in. thick and heavily braced and reinforced, as well as being adjustable as to pitch, and equipped with high carbon reversible cutting edge. Blade movement is from 7 in. below ground level to 14 in. above. The pump is of the simple rotary gear type which has been in use for the past eight years. Distribution will be through the McCormick-Deering tractor dealers.

New Metal Trench Guards

The Cleveland Trencher Co., Cleveland, O., has just announced a new product, a patented, interconnected metal trench and excavation guard. A series of these guards will enable the user to quickly construct a complete, unbroken fence entirely around any shape of excavation or alongside of any trench. The "guard rail holder" swivels in any direction assuring, it is stated, equal efficiency no matter at what angle the rails are set.

A feature of the guards that adds greatly to their value is that they are interconnected, thus eliminating considerable space. This connection of the rail has two further advantages, in that it also cuts in half the number of supports required on any job and sets the alternate rails at different heights, adding greatly to the attention value. Another feature is the combination lantern and flag support which places either well above the guard rail, and in full view from every direction. Flag or lantern is secured in position by the insertion of pin or nail, thus minimizing considerably the chance of loss or theft of the flags and lanterns.

These new trench guards are made of rust proofed malleable iron. The galvanized pipe legs and lantern-flags supports are threaded for ease in setting up and dismantling and the entire guard can be conveniently packed in small space for transportation.

New Hydraulic Controlled Grader

A new leaning wheel grader with hydraulic control has been announced recently by the Galion Iron Works Mfg. Co., Galion, O. On this grader a slight forward or backward movement of 8 short range levers makes every necessary adjustment without any further human effort. These controls are located directly in front of the operator. Power is supplied by a small dependable single cylinder 4-cycle gasoline engine of 1,500 r.p.m. which operates the pump supplying oil to the various cylinders. When it is desired to lean the wheels, side-shift the frame on rear axle, raise or lower the moldboard (one side or both at the same time); side-shift the moldboard, adjust

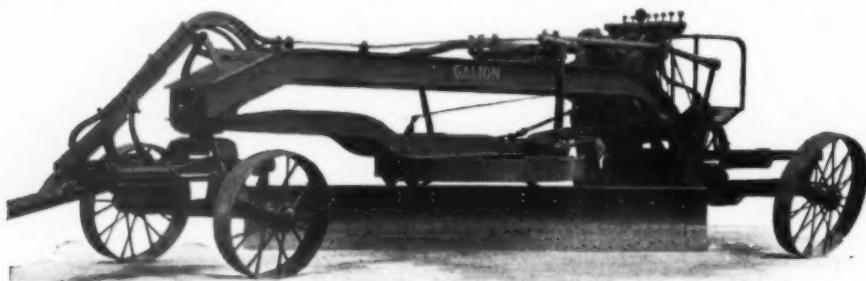
cement weighing batcher, the operator simply pushes a button which starts the feeding mechanism, and when the required number of pounds of cement have been deposited in the weighing hopper, the feed is automatically cut off. Motor for operating the feeder gate is equipped with an automatic brake so there is no coasting after the cut-off occurs. Discharge can be furnished, either of a manual type, or power operated with push-button control. The discharge door is of toggle operated type with large opening, so that the cement will flow rapidly from the batcher and discharge cleanly.

Electrical interlocks are also included to prevent discharging the batcher until the required number of pounds are in the hopper. The feeder gate is automatically prevented from rotating while the dis-

makes this model available either gas or diesel engine powered.

While the new Seventys are completely newly engineered and designed throughout, they have been fully tested and proven before production started. Some of the leading features of the Seventys are:

Eight speeds—six forward, two reverse. New, proven track design. New swing frame construction. Six track rollers on



Galion No. 14 Leaning Wheel Grader with Hydraulic Control.

the scarifier, or operate the steering gear, all that is necessary is to touch the proper lever and hydraulic power does the rest.

This No. 14 grader is furnished with a 12-ft. or 14-ft. moldboard and blade. The wheelbase is 20 ft. 4 in.; the overall length 33 ft.; the width 9 ft. 10 in.; and the height 8 ft. 1 in. The approximate weight is 13,000 lbs.

Blaw-Knox Full Automatic Cement Weighing Batcher

The Blaw-Knox Co., Pittsburgh, Pa., has placed on the market a full automatic cement weighing batcher for concrete mixing plants, electrically operated, in a complete range of sizes. These batchers contain many unique features attributing to accuracy of measurement and long life with low maintenance cost. The batcher can be attached to Blaw-Knox steel cement storage bins, wood bins or concrete bins. They can be furnished in any size up to and including batchers capable of handling 10,000 lb. of cement per batch, but the popular sizes are 1000-lb., 2000-lb. and 3000-lb. units.

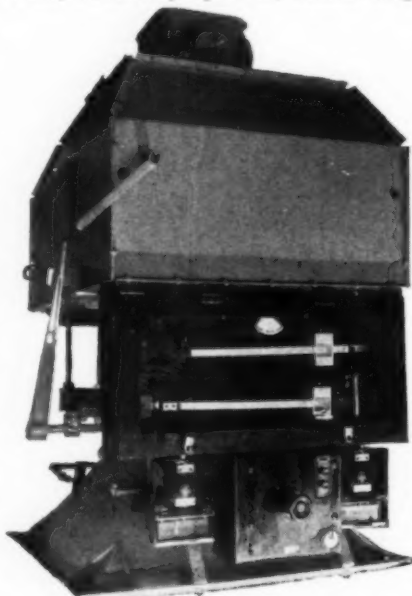
The cement weighing batcher can be equipped, either with beam scales, or with springless dial scales, as desired. Electrical contacts are included with the scale equipment for automatic operation.

The feeder unit, which is attached to the storage bin, consists of a cylindrical rotor with a series of pockets of its circumference. This rotor revolves and takes the cement from the storage bin, dumping it into the cement weighing hopper. Power is furnished by means of a totally enclosed electric motor, with reduction gear built in the head. The reduction gear and motor are enclosed in a single dust-tight cage.

In operating the Blaw-Knox automatic

charge door is open, and the discharge door cannot be opened while the feeder gate is in operation.

It is stated the Blaw-Knox full automatic, electrically operated, cement weigh-

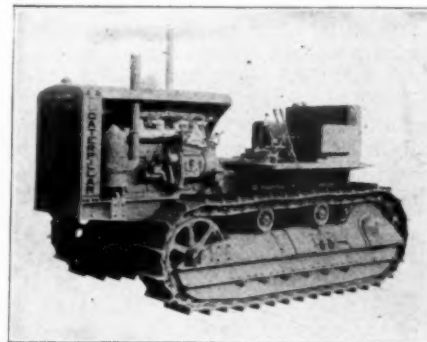


Blaw-Knox Full Automatic Cement Weighing Batcher

ing batcher will weigh successive batches of cement with an accuracy of more than 99 per cent. This equipment is now in use on general construction and on road work.

New Caterpillar Tractors

Two new tractors have been announced by the Caterpillar Tractor Co., Peoria, Ill. They are the "Caterpillar" Seventys, diesel or gas engines set into the same rugged chassis and the diesel Fifty, that now



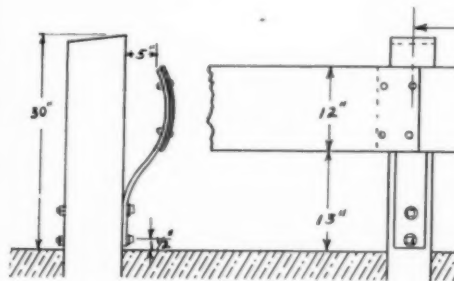
Caterpillar Diesel Seventy.

each side. Advanced idler design. Sturdier final drives to handle increased power. Weight and balance for performance. More effective oil seals. Increased traction. Greater accessibility. Diesel or gasoline power. Operator convenience—adjustable pedals; single gear shaft lever, handy, upright steering control; unmatched visibility. Here are the details:

New Tuthill Highway Guard

Tuthill Spring Co., 760 Polk St., Chicago, Ill., has recently incorporated some new features in the design of the Tuthill highway guard.

The new guard consists of a 10-in. or 12-in. wide steel rail, convexed, mounted



New Tuthill Highway Guard

on a flat leaf supporting spring which fastens to the base of the post. The rail sections are overlapped at the spring support and are slotted at one end, with round holes in the other end for ease in assembly and to permit expansion and contraction.

The bolts which go through the rails fasten to the top of the spring. This method of erection is contained all along the line.

The spring support is of tempered spring steel of extremely high tensile strength. This spring has slotted holes where it fastens to the base of the post, permitting variation in adjustment to keep a horizontal line at the top of the rail.